

NORTHERN REGION
FISHERY STATUS REPORT

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Division of Commercial Fisheries

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Northern Region
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REGION NORTHERN

GEOGRAPHICAL MANAGEMENT UNIT KUSKOKWIM AREA (335)

SPECIES SALMON

REGION NORTHERNGEOGRAPHICAL MANAGEMENT UNIT KUSKOKWIM AREA (335)

The Kuskokwim area includes all waters of the Kuskokwim River drainage and all waters of Alaska between Cape Newenham and 62° North Latitude. The present commercial salmon fishing area is divided into five sub-areas, three of which are located in the Kuskokwim River and two in the vicinity of Kuskokwim Bay. These are sub-area 335-10 (lower Kuskokwim River), sub-area 335-20 (middle Kuskokwim River), sub-area 335-30 (upper Kuskokwim River), sub-area 335-40 (Quinhagak) and sub-area 335-50 (Goodnews Bay). Sub-area 335-30 has been closed to commercial salmon fishing since 1966. For exact locations of these sub-areas see Figure 1.

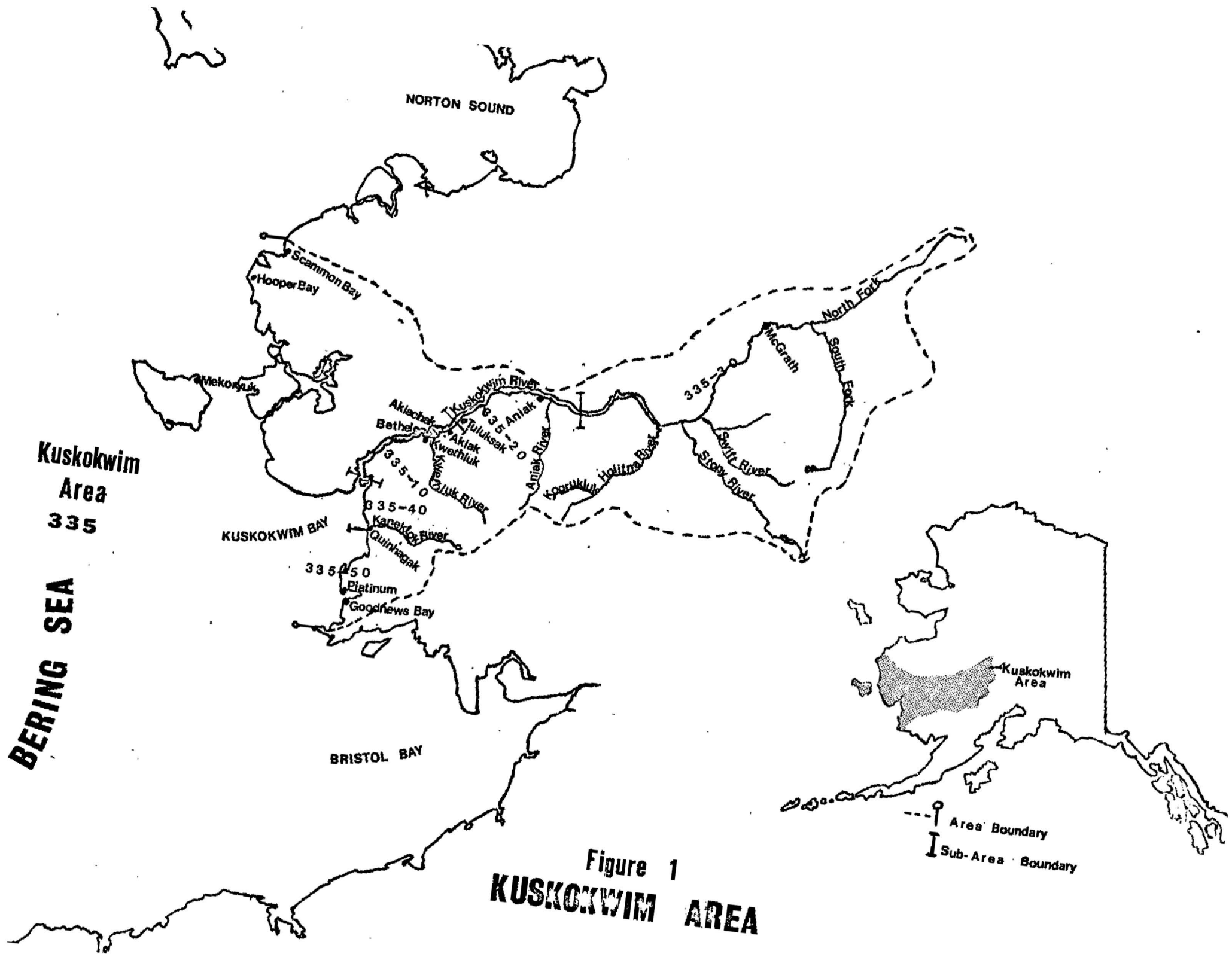
Commercial salmon fishing in the Kuskokwim area dates back to 1913 or earlier. The fishery prior to 1961 was often poorly documented, sporadic in nature and generally small. Since 1961 the commercial salmon fishery has expanded considerably in terms of numbers of fish harvested and effort and efficiency of the fishing fleet. Commercial fishermen, nearly all local native residents, are now fishing more hours of the open periods than previously, gear and vessels are improving and the method of fishing is changing from the operation of set gill nets to the more efficient drift gill nets. This expansion of the commercial fishery would not have been possible without improvements in processing and tendering facilities that have occurred throughout the area. Processing methods have recently changed from mild curing to an almost entirely fresh-frozen product.

Fishing seasons in the Kuskokwim River sub-areas are species oriented since there is very little overlap in the run timing of the three major

commercial salmon species (king, chum and coho). Small numbers of red and pink salmon are taken incidentally when fishing occurs for these major species.

In the Quinhagak and Goodnews Bay sub-areas king, red, chum and pink salmon occur coincidentally making it difficult to selectively manage for specific species. The coho salmon run in these sub-areas is later and distinct from the other species.

Subsistence fishing remains a very important form of utilization, especially in the Kuskokwim River drainage. The dependence on salmon for personal use may be more important to local residents than the money realized from commercial fishing. The subsistence needs of local residents play a very important role in the management of the salmon resource. Comprehensive surveys of this fishery have been made annually by the Department since 1960. Surveys made prior to 1960 were poorly documented and their accuracy is suspect.



REGION NORTHERN

GEOGRAPHICAL MANAGEMENT UNIT KUSKOKWIM RIVER (sub-areas 335-10, -20, -30)

SPECIES KING SALMON

Historical harvest data: Table 1 presents commercial and subsistence catches dating back to 1913. The commercial fishery prior to statehood (1960) was sporadic in nature and both commercial and subsistence catch data were poorly documented. It is quite likely that the total harvest (commercial and subsistence) did not exceed 50,000 fish during any one year prior to statehood.

The commercial fishery since 1960 has expanded greatly, but has stabilized during the past five years coincidental with the introduction of the management harvest goal of 35,000 to 40,000 fish (Figure 2). The recent 10-year average (1963-1972) of 30,532 fish is less than the recent 5-year average (1968-1972) of 39,726 fish.

Subsistence catches since 1960 have ranged from 14,656 to 69,219 fish and have not exhibited any definite trend (Figure 2). Declining catches in upriver areas have been offset by increasing catches in the lower river which are the result of changing dependence and effort. The recent 10-year average has been 42,091 compared to the recent 5-year average of 44,531.

Effort data (since 1960): Commercial fishing vessels have ranged from 111 to 418 during 1963-1972 (Figure 2). The recent 10-year average has been 270 compared to the recent 5-year average of 363. This information is only for sub-area 335-10, where the largest catches are made, and represents registered fishing vessels during 1961-1964 and actual fishing vessels making deliveries during 1965-1972.

Subsistence fishing effort in terms of numbers of fishing families has ranged from 332 to 576 during 1961-1972 with the recent 10-year average being

454 compared to the recent 5-year average of 490 (Figure 2).

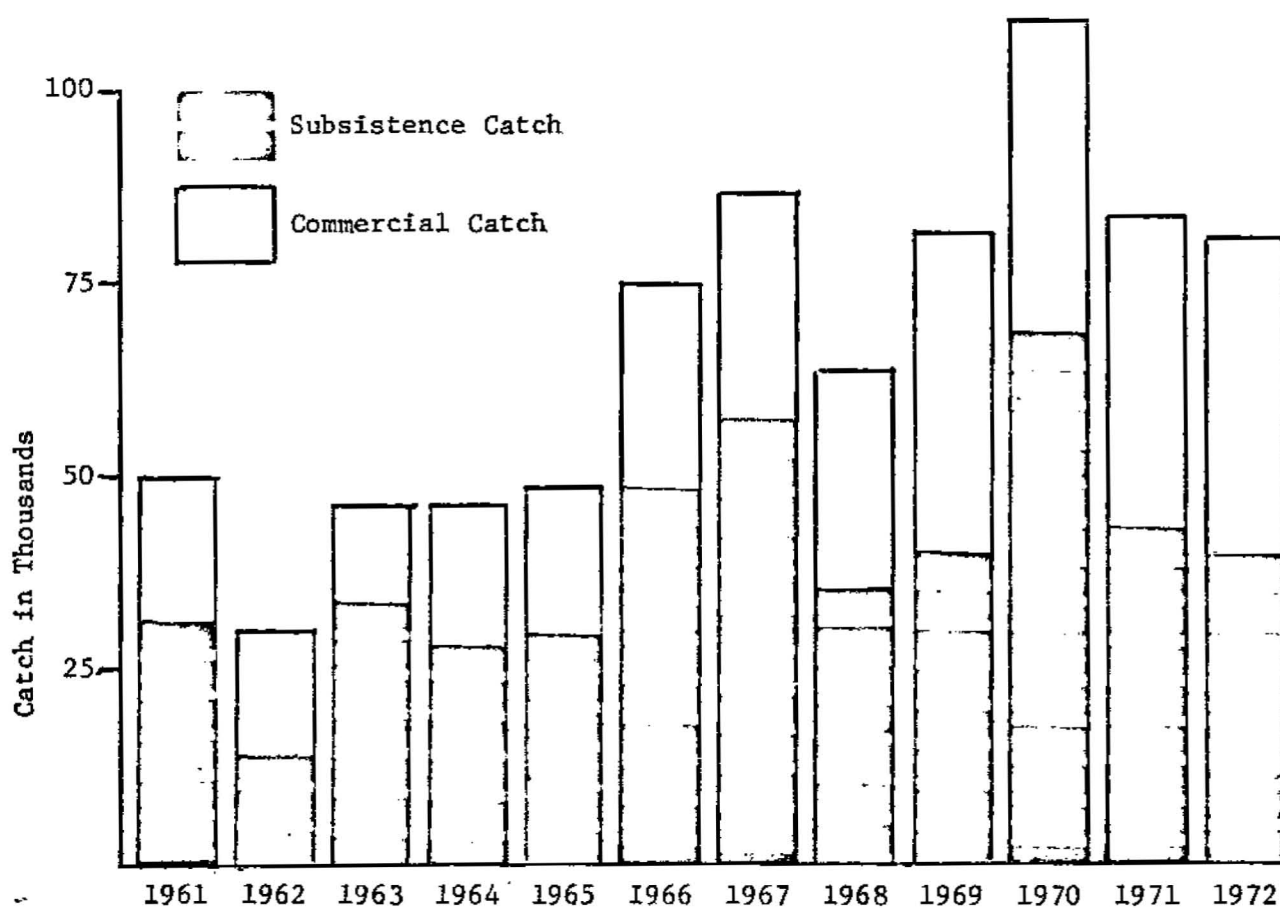
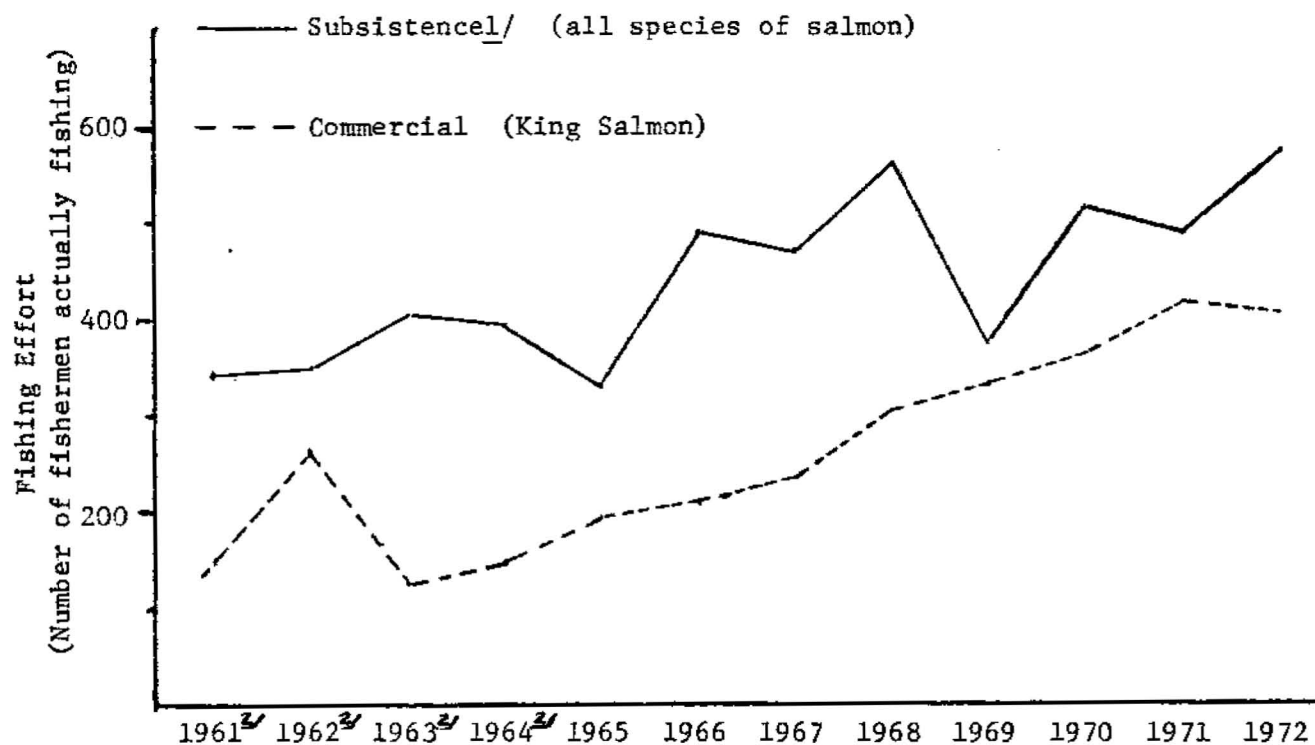
Escapement data: Comparable escapement indices are presented in Table 2. With the possible exception of the smaller than average 1972 escapement, previous escapements have been considered good.

Status related to MSY: The Kuskokwim River king salmon stocks are probably being harvested by the commercial and subsistence fisheries at the maximum rate. Until future returns can be studied and additional escapement information is obtained, commercial harvests should not exceed 35,000-40,000 fish annually. Taking into account recent annual subsistence catches, MSY is, therefore, considered to range between 75,000-80,000 fish.

Management and research strategy: Commercial harvests are not allowed to exceed 40,000 fish because of the very large catches made by subsistence fishermen. Commercial fishing is allowed for only two 12-hour periods a week which is an attempt to spread the harvest over a greater portion of the run thereby preventing overharvest of any particular run segment or race. The commercial fishing season is also delayed until the king salmon run is distributed throughout the lower 100 miles of river. The delayed opening prevents possible over-harvest of the early run and gives subsistence fishermen an opportunity to begin fishing without interruption from the commercial fishery.

Due to increases in subsistence fishing for kings in the lower river, all subsistence fishing in the lower sub-area is now prohibited for 24 hours prior to each commercial fishing period during the king salmon season. This was done to insure adequate escapement, reduce illegal sales of subsistence caught fish and prevent wastage by requiring subsistence fishermen to clear their nets at least twice a week. Further expansion of commercial fisheries for the other salmon species should be allowed only if similar subsistence fishing restrictions are initiated.

Figure 2. Kuskokwim River king salmon catch and effort data, 1961 - 1972.



^{1/} Number of fishing families

^{2/} Number of vessel licenses issued

In-season management of the commercial fishery is based on analysis of comparative commercial and test fishing catches which indicate relative run magnitudes. The duration of fishing periods and seasons are altered by emergency order when unusually small or large runs are indicated or when the commercial harvest goal is attained.

It is the long-range management goal to maintain present harvest levels until future returns can be studied and additional escapement information is obtained. To accomplish this, an increase in staffing and operational funds is required for both management and research activities. Primary research emphasis should be directed toward obtaining additional escapement information regarding the quantity and quality (age, size and sex composition) of spawners throughout the drainage.

There are many problems associated with management and research of Kuskokwim River king salmon and the more important of these are:

1. Due to the large size of the area and turbid water conditions, it is impossible to obtain accurate escapement data that can be used for in-season management of the commercial fishery. At present there is only one counting tower on the entire Kuskokwim River drainage. Indices of escapements are made by aerial survey estimates of a few selected streams, but variable weather and stream conditions make results difficult to interpret.
2. Fishing effort and efficiency has increased tremendously during the past few years necessitating reduction in weekly commercial fishing periods from 24-hour to 12-hour periods.
3. The fishery harvests unknown proportions of various stocks or races bound for many tributaries. It is possible that certain races are

being either under or overharvested.

4. Increasing numbers of subsistence fishermen are also participating in the commercial fishery, especially in the lower river. There are still many fishermen who utilize salmon only for personal use, but their ranks are declining. Both groups do not want any subsistence fishing restrictions placed upon them, yet this is necessary for conservation of the king salmon run.
5. The intensive commercial fishery is believed to be selective toward certain sized kings, primarily large productive females and the result of this on escapements and future returns is not completely understood.
6. Salmon and salmon roe are being illegally sold by subsistence fishermen during the commercial fishing season.
7. The Japanese mothership fishery probably intercepts large numbers of Kuskokwim River kings.

Economic status: The present value of the commercial king salmon harvest to the fisherman (based on the recent 5-year average catch x most recent year price per fish of \$8.00) is \$318,000.

It is difficult to accurately determine the economic value of the subsistence fishery. Recent catches have averaged in excess of 900,000 pounds (round weight) annually. It is estimated that one-half of this catch is consumed fresh (360,000 pounds dressed weight) with the remainder consumed as smoked fish (112,500 pounds processed weight). If a similar amount of protein would have to be purchased locally at \$2.00 per pound, then the value is estimated at \$945,000.

Table 1. Kuskokwim River historical king salmon catches, 1913-1972.

Year	Commercial ^{1/}	Subsistence ^{2/}	Total
1913	7,800		7,800
1914	-		
1915	-		
1916	949		949
1917	7,878		7,878
1918	3,055		3,055
1919	4,836		4,836
1920	34,853		34,853
1921	9,854		9,854
1922	8,944		8,944
1923	7,254		7,254
1924	19,253	14,700	33,953
1926	1,664	10,800	12,464
1930	7,515		7,515
1931	8,541		8,541
1932	9,399		9,399
1933	-	6,290	6,290
1934	-	20,800	20,800
1935	6,448	22,930	29,378
1936	624	33,500	34,124
1937	480	-	480
1938	624	10,153	10,777
1939	134	14,000	14,134
1940	247	8,000	8,247
1941	187	8,000	8,187
1942	-	6,400	6,400
1943	-	6,400	6,400
1946	2,288		2,288
1947	5,356		5,356
1951	4,210		4,210
1954	57		57
1959	3,760		3,760
1960	5,969	20,931	26,900
1961	18,918	31,136	50,054
1962	15,341	14,656	29,997
1963	12,016	34,615	46,631
1964	17,149	29,017	46,166
1965	21,989	27,143	49,132
1966	25,545	49,606	75,151
1967	29,986	57,875	87,861
1968	34,278	30,230	64,508
1969	43,997	40,138	84,135
1970	39,290		108,509
1971	40,274	42,926	83,200
1972	40,795	40,145	80,940

^{1/} Subdistrict 335-10, -20 and -30.

^{2/} Catches are expanded and include all villages surveyed each year. Data includes a few villages not included in comparative catch tables.

Table 2. Comparative Kuskokwim River drainage king salmon escapement counts.^{1/2/}

Kwethluk River				Kisaralik River			
Year	Estimated Count	Area Surveyed ^{3/}	Survey Rating	Year	Estimated Count	Area Surveyed	Survey Rating
1960	1,320	Upper 40 miles	?	1960	1,104	90 miles	Fair
1962	248	85 miles	Poor	1962	327	90 miles	Poor
1966	516	Upper 35 miles	Fair	1965	194	Below canyon	Poor
1968	800	85 miles	Fair	1966	204	Upper 60 miles	Poor
1972	68	Upper 20 miles	Poor	1968	487	Upper river	Fair
				1970	531	Airstrip to Quicksilver Cr.	Fair

Aniak River ^{4/}				Aniak River (above Salmon River)			
Year	Estimated Count	Area Surveyed	Survey Rating	Year	Estimated Count	Area Surveyed	Survey Rating
1960	1,881	80 miles	Fair	1966	485	Salmon R. to lake	Fair
1961	497	80 miles	Fair	1967	758	Salmon R. to lake	Poor
1962	925	80 miles	Fair	1968	783	Salmon R. to lake	Good
1965	646	Mile 20 to lake	Poor	1969	537	Salmon R. to lake	--
1966	2,184	Buckstock R. to lake	Fair	1970	592	Salmon R. to Waterboot Cr.	Fair
1968	1,420	Buckstock to Kipchuk River	Fair	1971	144	Waterboot Creek to Aniak Lake	Poor
1970	1,231	20 mi. below Salmon R. to Waterboot Creek	Fair	1972	93	Salmon R. to lake	Poor

Table 2. (continued) Comparative Kuskokwim River drainage king salmon escapement counts.^{1/2/}

Salmon River				Kipchuk River			
Year	Estimated Count	Area Surveyed	Survey Rating	Year	Estimated Count	Tower Count	Survey Rating
1960	223	30 miles	Good	1960	513	45 miles	Good
1966	141	Lower 25 miles	Poor	1966	491	Lower 22 miles	Good
1970	381	Lower 25 miles	Fair	1967	200	Lower 25 miles	Poor
1972	43	30 miles	Poor	1968	319	?	Fair
				1970	821	Mouth-Cripple Creek	Fair

Chukowan River				Kogrukluk River			
Year	Estimated Count	Area Surveyed	Survey Rating	Year	Estimated Count	Tower Count	Survey Rating
1966	986	35 miles	Good	1961	214	50 miles	Fair
1968	1,260	35 miles	Fair	1966	1,645	50 miles	Good
1970	1,118	35 miles	Good	1967	1,033	50 miles	Poor
1972	163	35 miles	Poor	1968	2,180	50 miles	Fair
				1969	-	3,386	--
				1970	1,598	4,463	Fair
				1971	636	35 miles	Poor
				1972	476	1,926	Fair

^{1/} All counts are from aerial surveys except Kogrukluk River tower counts.

^{2/} Aerial survey counts were made only in main stem of each river listed.

^{3/} "Entire" usually does not include several miles of the lower sections of streams where turbid water conditions prevent observation of fish.

^{4/} Includes Aniak River above Salmon River.

REGION NORTHERN

GEOGRAPHICAL MANAGEMENT UNIT KUSKOKWIM RIVER (Sub-areas 335-10, -20, -30

SPECIES COHO SALMON

Historical harvest data: All commercial catches are listed in Table 3. Commercial catches prior to statehood were virtually nonexistent. Since 1960 commercial catches have ranged from 2,498 to 127,306 fish (Figure 3). The recent 10-year average has been 41,316 as compared to the recent 5-year average of 55,500 fish. Catches have been unpredictable due to extreme fluctuations in runs and effort. Many fishermen do not fish during the month of August (when the run occurs) as a result of poor weather conditions, moose hunting and other food gathering activities.

Relatively few coho salmon are utilized for subsistence purposes due to the unsuitable weather for drying fish and requirements of other food gathering activities. Many fishermen do not distinguish coho from chum salmon, and for this reason subsistence catches of this species have been included with chum salmon.

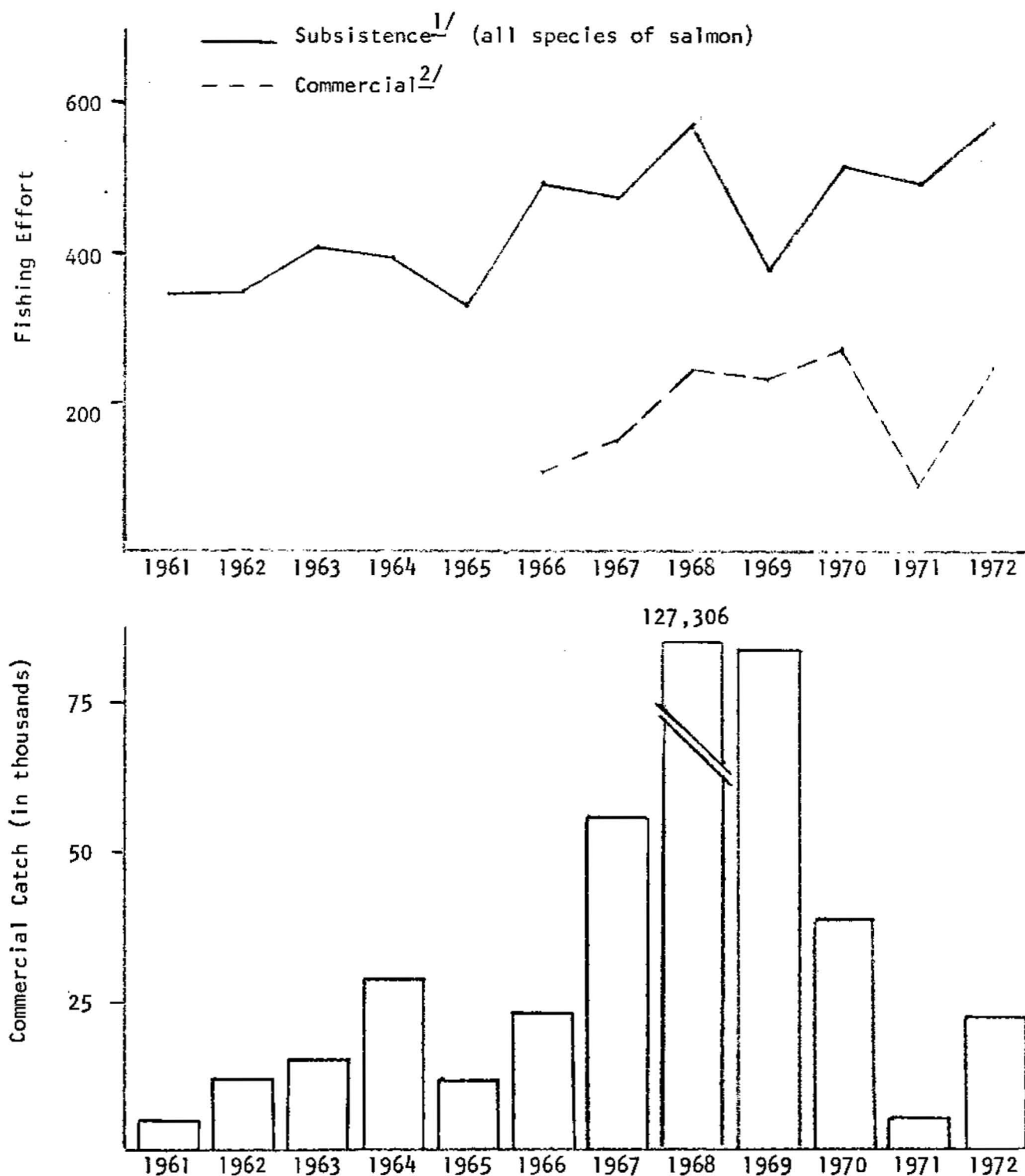
Effort data (since 1961): The numbers of commercial fishermen who have actively engaged in the fishery have ranged from 83 to 277 annually since 1966 (Figure 3). The recent 5-year average has been 216 fishermen.

Subsistence fishing effort is identical to that discussed under "king salmon."

Escapement data: Virtually nothing is known about escapement magnitude or spawner distribution. Due to the lateness of the run, all escapement monitoring projects are terminated prior to spawning.

Status related to MSY: Estimation of MSY is precluded by the lack of suitable information.

Figure 3. Kuskokwim River coho salmon catch and effort data, 1961-1972.



1/ Numbers of fishing families.

2/ Actual numbers of fishermen participating during coho salmon season.

Management and research strategy: Present commercial catches should be maintained at present levels until studies can be initiated regarding the sizes of runs and escapements. Most of the problems listed for "king salmon" also apply to this species.

Economic status: The present value of the commercial fishery to the fishermen (based on recent 5-year average catch x most recent year price per fish of \$1.50) is \$83,000.

Table 3. Kuskokwim River historical commercial coho salmon catches, 1924-1972.

Year	Catch
1924	7,167
1935	8,296
1938	828
1940	500
1941	674
1946	674
1960	2,498
1961	5,044
1962	12,432
1963	15,660
1964	28,613
1965	12,191
1966	22,985
1967	56,313
1968	127,306
1969	83,765
1970	38,601
1971	5,253
1972	22,579

REGION NORTHERN

GEOGRAPHICAL MANAGEMENT UNIT KUSKOKWIM RIVER (Sub-areas 335-10, -20, -30)

SPECIES CHUM SALMON

Historical harvest data: Commercial catches have been recorded for only 1924 and 1967 through 1972 (Table 4). Prior to 1971 only limited numbers of chums were taken commercially and represented fish taken incidentally during the commercial king and coho salmon fisheries. Expansion of the commercial chum salmon fishery was allowed beginning in 1971 as there were no indications that a moderate harvest (50,000-100,000 fish) would be biologically unsound. The commercial harvests in 1971 and 1972 were 68,914 and 78,398 respectively (Figure 4).

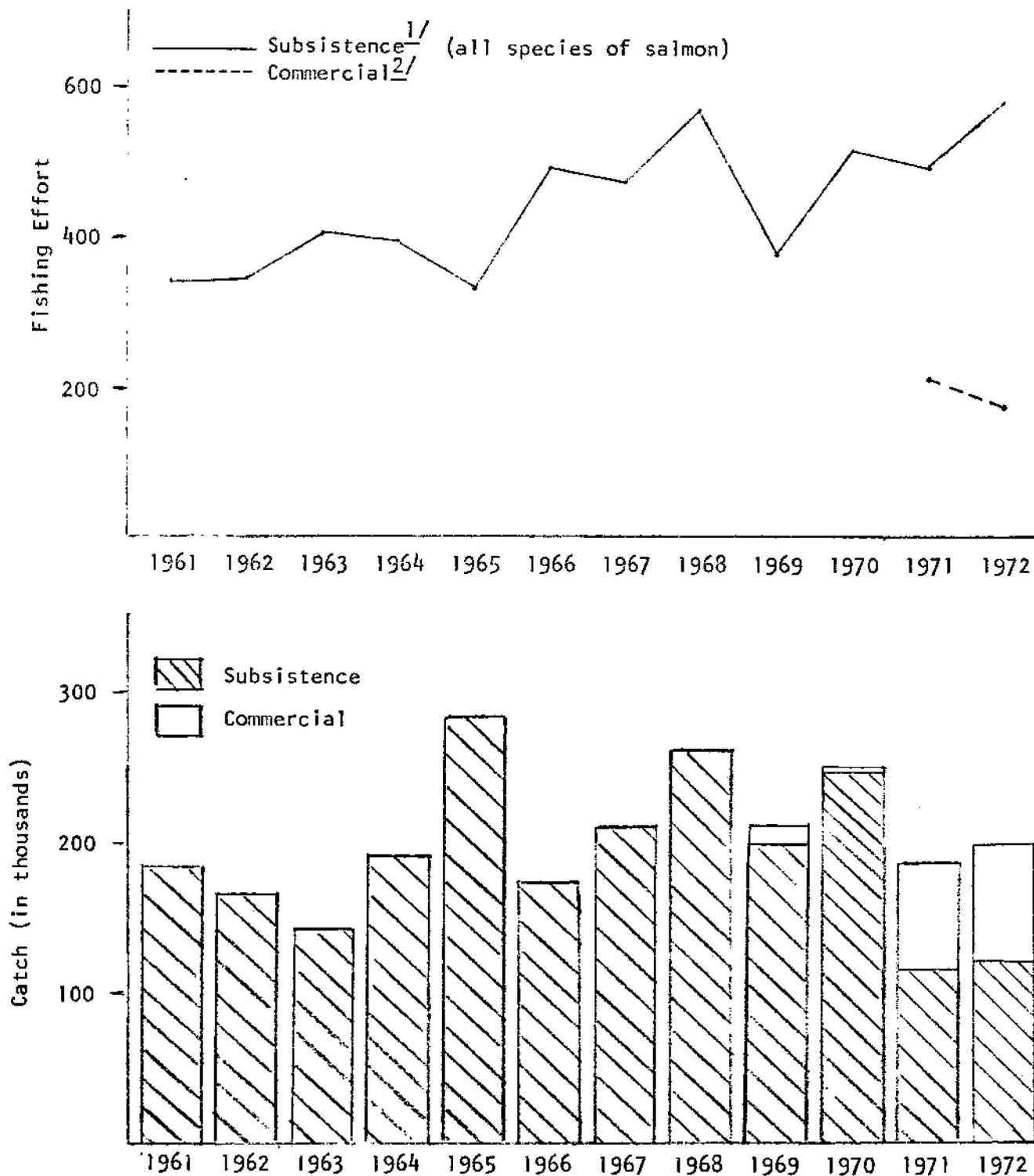
Early subsistence catch records during 1924-1943 indicate an average annual sustained catch of 443,000 chum salmon. Average subsistence catches for the past ten years have been 193,550, while the recent 5-year average has been 188,182 fish (Figure 4). This reduction in harvest is believed to be largely influenced by lessening dependence on subsistence fishing for this species.

Effort data (since 1961): Commercial fishing effort during the chum salmon fishery, in terms of participating gear holders, was 216 in 1971 and 176 in 1972. There is no accurate measure of commercial fishing effort prior to 1971 since chum salmon were captured only incidentally to other species.

Subsistence fishing effort is identical to that discussed under "king salmon."

Escapement data: There are a minimum of 16 known chum salmon spawning tributaries, several over 75 miles in length, in the Kuskokwim River drainage. Most of these streams cannot be surveyed annually due to fund limitations and

Figure 4. Kuskokwim River chum salmon catch and effort data, 1961-1972.



^{1/} Numbers of fishing families.

^{2/} Actual numbers of fishermen participating in 1971-72 chum salmon season, prior to 1971 catches were only incidental to the king salmon fishery.

^{3/} There were small numbers of commercially caught fish during the 1967-1968 period which are not shown.

adverse stream or weather conditions. Usually not more than three tributary streams can be adequately surveyed in any given season, but as many as 185,000 spawning chums have been counted. Much of the upper half of the drainage remains unsurveyed.

Status related to MSY: There is insufficient information to accurately evaluate this problem. Average annual utilization (commercial plus subsistence) was 443,000 during 1924-1943 and has declined to 188,000 during 1968-1972. This decline is the result of subsistence fishing effort and not necessarily salmon abundance. Although a high seas fisheries has developed in recent years, it is probable that a harvestable surplus of unknown quantity does exist at this time.

Management and research strategy: Since 1971 the Department has allowed a bonafide commercial chum salmon fishery in the lower sub-area immediately after the king salmon season. During the chum salmon season the fishing area is reduced by about one-half and gill nets of only 6-inch or smaller mesh can be operated. This allows for a better controlled fishery and reduces the harvest of late-running king salmon.

Annual commercial harvests will be allowed to expand slightly, but should not exceed 100,000 fish until additional studies are conducted regarding population size. Increased commercial harvests can be allowed in the interim if the present trend of declining subsistence effort and harvest continues for a few more years.

Other management techniques and problems listed for "king salmon" also apply to this species.

Economic status: The present value of the commercial harvest to the fishermen (based on recent 2-year average catch (1971-1972) x most recent year price per fish of \$1.25) is \$92,000. The potential value to fishermen is unknown, but may be significantly greater.

It is difficult to accurately estimate the economic value of the subsistence fishery. Recent catches have averaged in excess of 1.3 million pounds (round weight) annually. Many of the chums are dried and fed to sled dogs which decrease their economic value (compared to king salmon, which are eaten by people). It is estimated that 13,000 pounds (dressed weight) are consumed fresh by people and 257,400 pounds of dried fish (processed weight) are consumed by both people and dogs. If a similar amount of protein would have to be purchased locally (\$2 per pound for fresh fish and \$1 per pound for dried fish), then the value of the subsistence fishery is estimated at \$285,000.

Table 4. Kuskokwim River historical chum salmon catches, 1924-1972.

Year	Commercial	Subsistence ^{1/}	Total
1924	7,167	203,148	210,315
1925		230,850	230,850
1926		738,576	738,576
1927		286,254	286,254
1928		481,090	481,090
1929		560,196	560,196
1930		538,650	538,650
1931		389,367	389,367
1932		746,415	746,415
1933		433,998	433,998
1934		597,132	597,132
1935		554,040	554,040
1936		549,423	549,423
1937		537,111	537,111
1938		400,242	400,242
1939		125,425	125,425
1940		415,523	415,523
1941		415,523	415,523
1942		325,339	325,339
1943		325,800	325,800
1960		327,297	327,297
1961		185,447	185,447
1962		165,626	165,626
1963		141,550	141,550
1964		189,660	189,660
1965		283,459	283,459
1966		174,660	174,660
1967	148	205,263	205,411
1968	187	260,023	260,210
1969	7,165	198,628	205,793
1970	1,664	245,550	247,214
1971	68,914	116,391	185,305
1972	78,619	120,316	198,935

^{1/} Includes small numbers of red, coho and pink salmon.

REGION NORTHERN

GEOGRAPHICAL MANAGEMENT UNIT QUINHAGAK (sub-area 335-40)

SPECIES KING SALMON

Historical harvest data: Table 5 shows commercial and subsistence harvests dating back to 1961. Commercial fishing for king salmon was initiated in 1961 and was very sporadic during early years. Since 1969 the commercial fishery has been more stable due to improved local processing facilities being available for a longer duration. In recent years the majority of the catch has been processed by floating freezer ships or barges.

Since the inception of the commercial fishery, annual catches have ranged from no catch to 18,629 fish (Figure 5). The recent 10-year average has been 7,826 compared to the recent 5-year average of 12,875 fish.

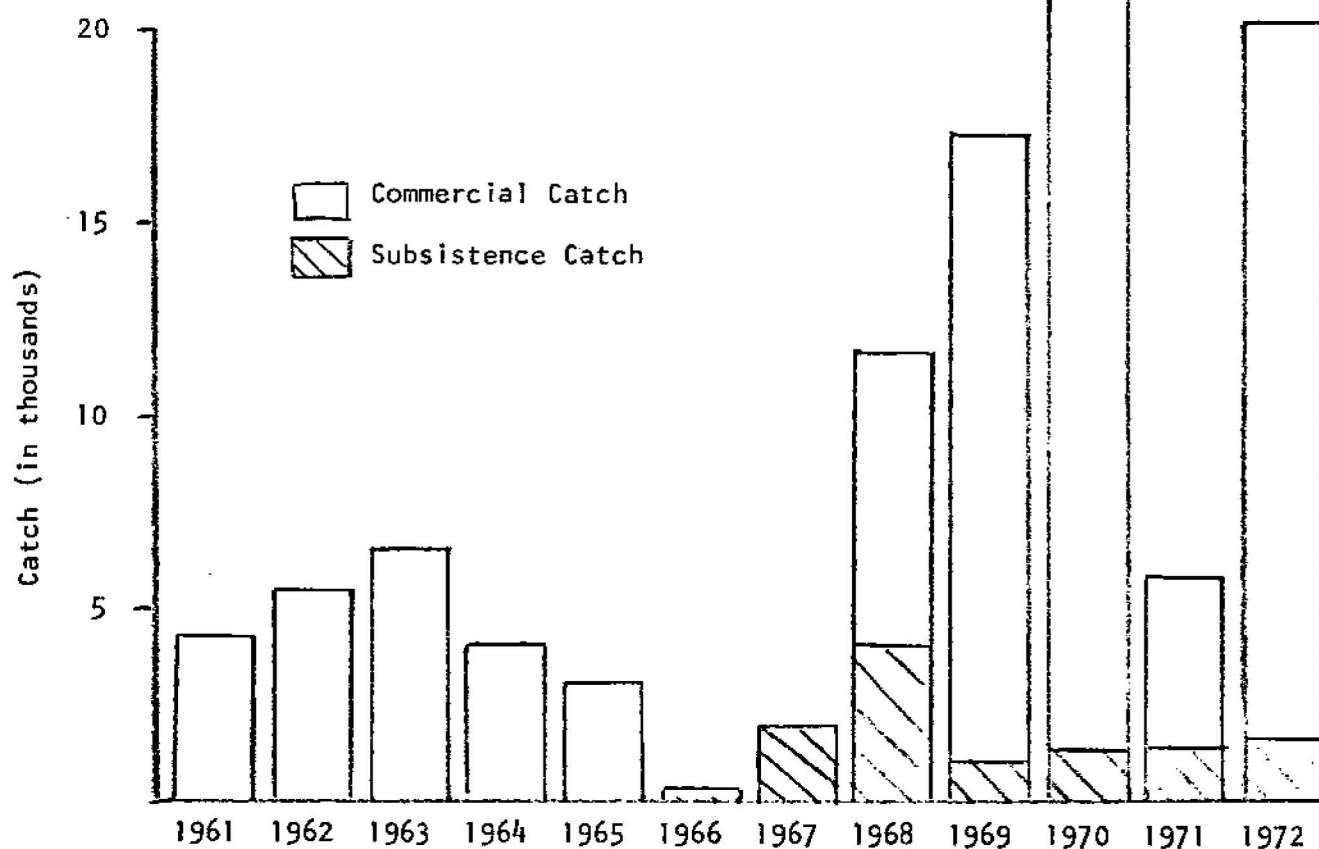
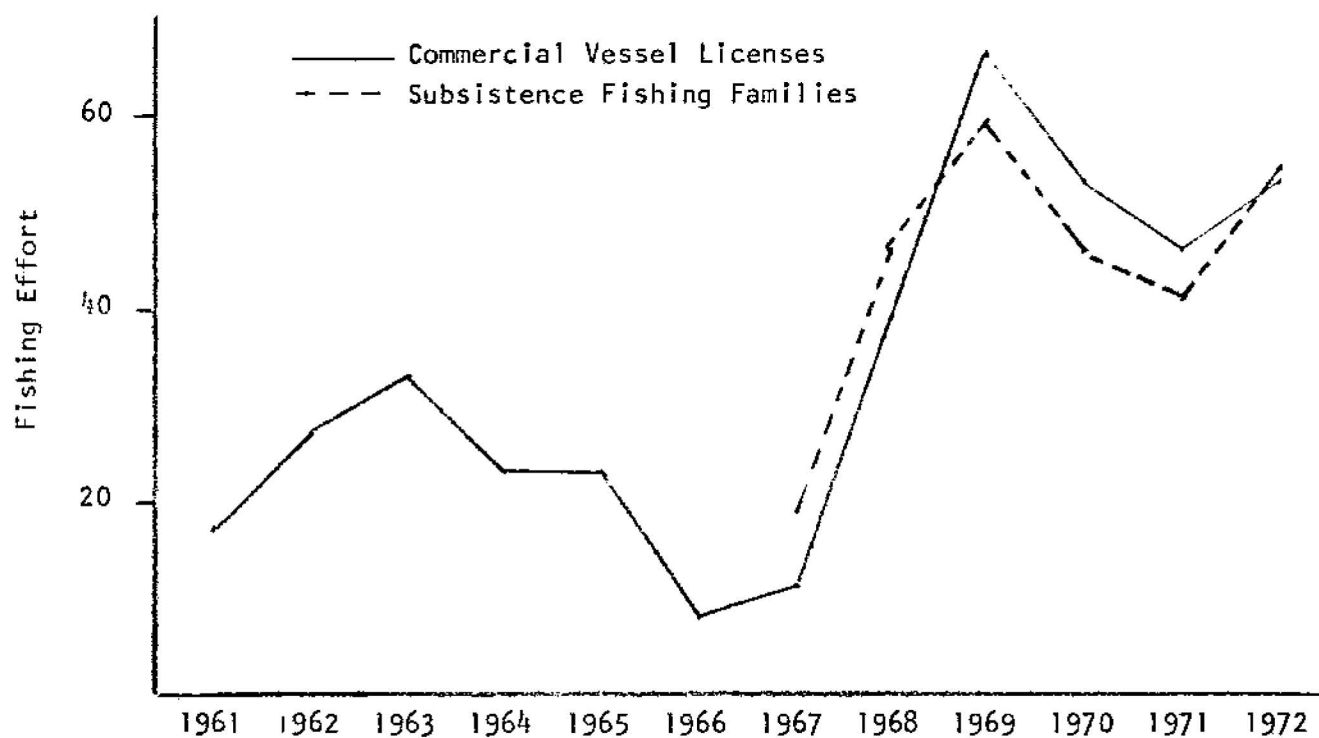
Although accurate comparable subsistence harvest data is lacking for many years, observations indicate that the dependence on subsistence fishing has declined during recent years. Catches have ranged from 1,349 to 3,002 fish since 1967 (Figure 5).

Effort data (since 1961): The number of registered commercial gear license holders has ranged from 4 to 65 with the recent 10-year average being 35 and the recent 5-year average being 51 (Figure 5).

The number of subsistence fishing families reporting catches has ranged from 19 to 59 since 1967 (Figure 5).

Escapement data: The bulk of the king salmon passing through this fishery spawn in the Kanektok River. Aerial survey counts of Kanektok River spawners are shown in Table 6. Turbid water conditions are often encountered which preclude surveys or limit survey effectiveness. Kanektok River spawner densities are among the highest observed in the region.

Figure 5. Quinhagak king salmon catch and effort data, 1961-1972.



Status Related to MSY: Until further studies are conducted recent commercial catch levels of 15,000 to 18,000 fish must be considered maximum. With the inclusion of subsistence catches MSY is in the range of 17,000-20,000 fish.

Management and research strategy: Previous tagging studies have indicated that the majority of kings taken in this fishery are bound for the Kanektok River which receives a later run than does the Kuskokwim River. The commercial fishing season is opened later than that of the Kuskokwim River to accommodate the later arrival of local stocks and to prevent interception of Kuskokwim River stocks. The weekly fishing periods are of short duration (two 12-hour periods per week) and spaced far enough apart so that adequate escapements can reasonably be assured. Even so, commercial fishing for this species has been curtailed by emergency order during some recent years due to excessive harvesting.

Increased funding (including personnel) is required to better manage the Quinhagak fishery. Due to the remoteness of the area and the press of the expanding Kuskokwim River fishery, the Bethel area biologist cannot manage this expanding fishery on a maximum sustained yield basis. A temporary fisheries biologist should be stationed in the area during the three-month fishery to monitor catches, sample catches for biological data, conduct escapement surveys and assist with enforcement and public relation activities.

Economic status: The present value of the commercial fishery to the fishermen (based on recent 5-year average catch x most recent year price per fish of \$7.15) is \$92,000. The potential value (assuming MSY attained) is estimated to be \$129,000.

It is difficult to accurately determine the economic value of the subsistence fishery. Recent catches have averaged 37,000 pounds (round weight) annually. It is estimated that half of this catch is consumed fresh (15,000

pounds) with the remainder consumed as dried or smoked fish (4,500 pounds).

If a similar amount of protein would have to be purchased locally at \$2.00 per pound, then the value of the subsistence fishery is estimated at \$39,000.

Table 5. Quinhagak historical king salmon catches, 1961-1972.

Year	Commercial	Subsistence	Total
1961	4,328		4,328
1962	5,526		5,526
1963	6,555		6,555
1964	4,081		4,081
1965	2,976		2,976
1966	278		278
1967	0	1,349	1,349
1968	8,879	2,756	11,635
1969	16,802	1,594	18,396
1970	18,629	2,157	20,786
1971	4,185	2,254	6,439
1972	15,880	3,002	18,882

Table 6. Aerial survey counts of Kanektok River king salmon, 1960-1972.

Year	River Miles Surveyed	Survey Rating	King Salmon
1960	75	Fair	6,047
1961	60	Poor	1,650
1961	75	Fair	1,516
1962	75	Fair	935
1964	75	Poor	627
1966	75	Fair	3,718
1967	45	Fair	2,605
1968	75	Fair	4,170
1969	-	Poor	119
1970	50	Fair	3,112
1971	No survey made		
1972	38	Poor	73

REGION NORTHERN

GEOGRAPHICAL MANAGEMENT UNIT QUINHAGAK (Sub-area 335-40)

SPECIES COHO SALMON

Historical harvest data: Table 7 presents annual commercial and subsistence catches dating back to 1960. The coho salmon run begins in early August and continues into September. Severe storms often hamper fishing effort.

The commercial coho salmon fishery was extremely limited until the area gained local processing capabilities. Annual commercial catches have ranged from no harvest to 21,511 fish (Figure 6). The recent 10-year average has been 5,910 fish compared to the recent 5-year average of 11,359.

Cohos comprise the main portion of the subsistence catch. Subsistence fishing generally begins after the end of the commercial fishing season when cohos are the most abundant species available. Only limited subsistence catch surveys have been conducted with the largest catch of 17,480 recorded in 1970. Observations indicate a recent decline in subsistence fishing dependence.

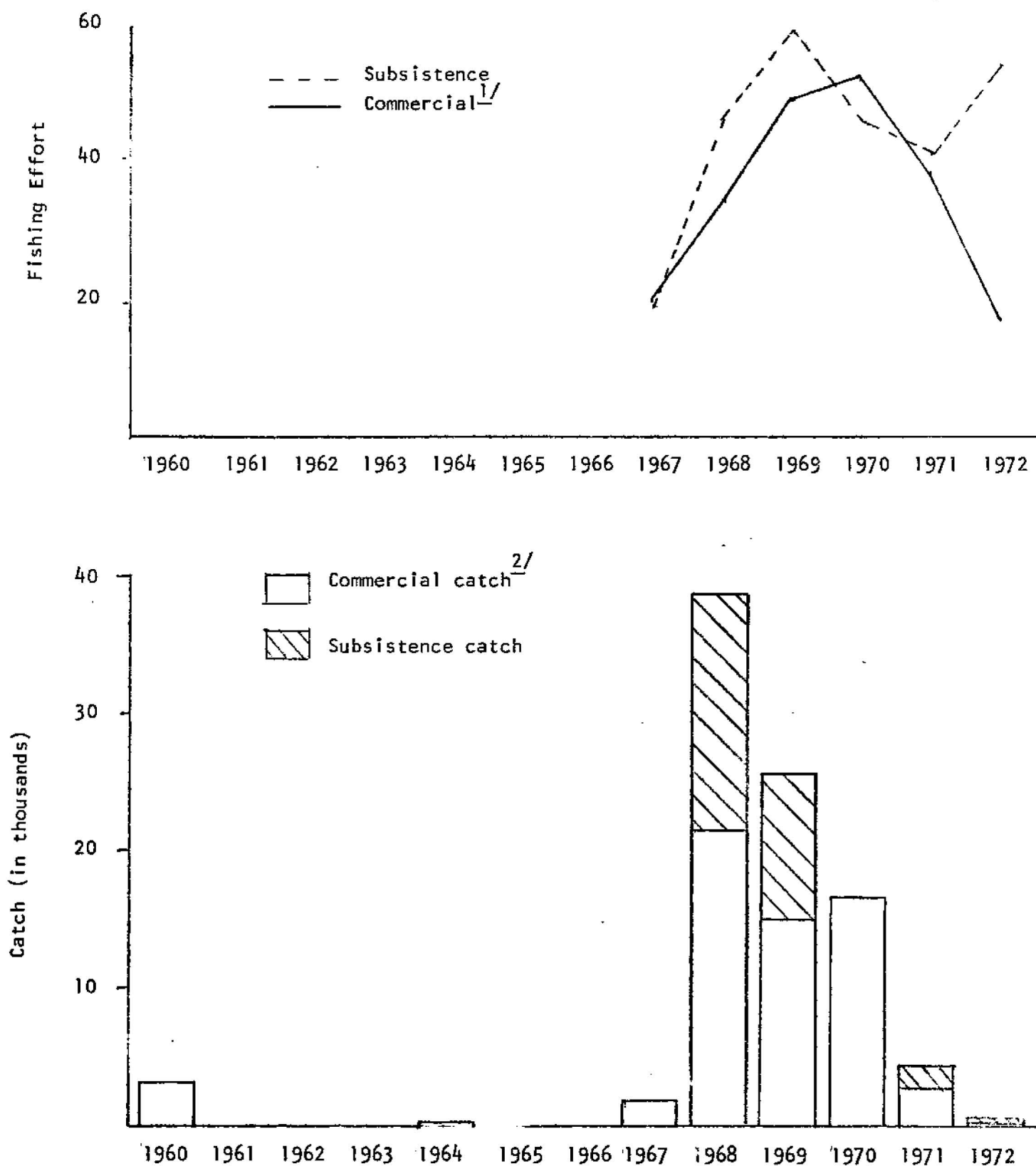
Effort data (since 1961): Commercial fishing effort has ranged from a low of 4 to a high of 52 fishermen (Figure 6). The recent 6-year average is 35 fishermen. Fishing effort will vary greatly during the coho season due to variable weather conditions and the length of time the processing ship remains in the area.

Subsistence fishing effort data is similar to that for king salmon.

Escapement data: Very little data has been collected concerning the coho salmon in this area. Inclement weather often hinders valid observations and renders the counts difficult to analyze.

Status related to MSY: There is not sufficient information to determine MSY, but recent commercial harvest levels can probably be maintained and even increased slightly.

Figure 6. Quinhagak coho salmon catch and effort data, 1960-1972.



1/ Some small effort during 1960-1967 not shown

2/ Some small catches during 1960-1967 not shown.

Management and research strategy: Until information is obtained regarding population size, annual commercial harvests should not be allowed to exceed 20,000-25,000 fish. It should be noted that combined commercial and subsistence harvests of up to 39,000 cohos have been recorded in a single season.

Often fishing time extensions (up to seven days a week) are granted to compensate for lost fishing time resulting from storms.

Other comments made under "king salmon" apply also to this species.

Economic status: The present value of the commercial fishery to the fishermen (based on recent 5-year average catch x the most recent price per fish of \$1.20) is \$13,500. The potential value, assuming sustained commercial harvests of 20,000 fish, is \$24,000.

Subsistence catches have averaged 53,000 pounds (round weight) annually. Most of this catch is consumed as fresh fish (42,000 pounds, dressed weight). If a similar amount of protein would have to be purchased locally at \$2 per pound, the value is estimated at \$84,000.

Table 7. Quinhagak historical coho salmon catches, 1960-1972.

Year	Commercial	Subsistence ^{1/}	Total
1960	3,000		3,000
1961	46		46
1962	0		0
1963	0		0
1964	379		379
1965	0		0
1966	0		0
1967	1,926		1,926
1968	21,511	17,480	38,991
1969	15,077	10,573	25,650
1970	16,850	-	16,850
1971	2,982	1,476	4,458
1972	376	486	862

^{1/} Subsistence catch surveys not conducted prior to 1968 and in 1970.

REGION NORTHERN
 GEOGRAPHICAL MANAGEMENT UNIT QUINHAGAK (Sub-area 335-40)
 SPECIES RED SALMON

Historical harvest data: Commercial catches since 1960 have ranged from no harvest to 13,422 fish (Figure 7, Table 8). The largest catches were made in 1962 and 1964--10,313 and 13,422 respectively. The recent 10-year average has been 3,845 compared to the recent 5-year average of 4,293. The majority of red salmon were captured incidentally to the king salmon fishery.

Subsistence fishing for red salmon has traditionally been light. The majority of the subsistence fishing is done after the commercial fishing season ends and long after the reds have passed.

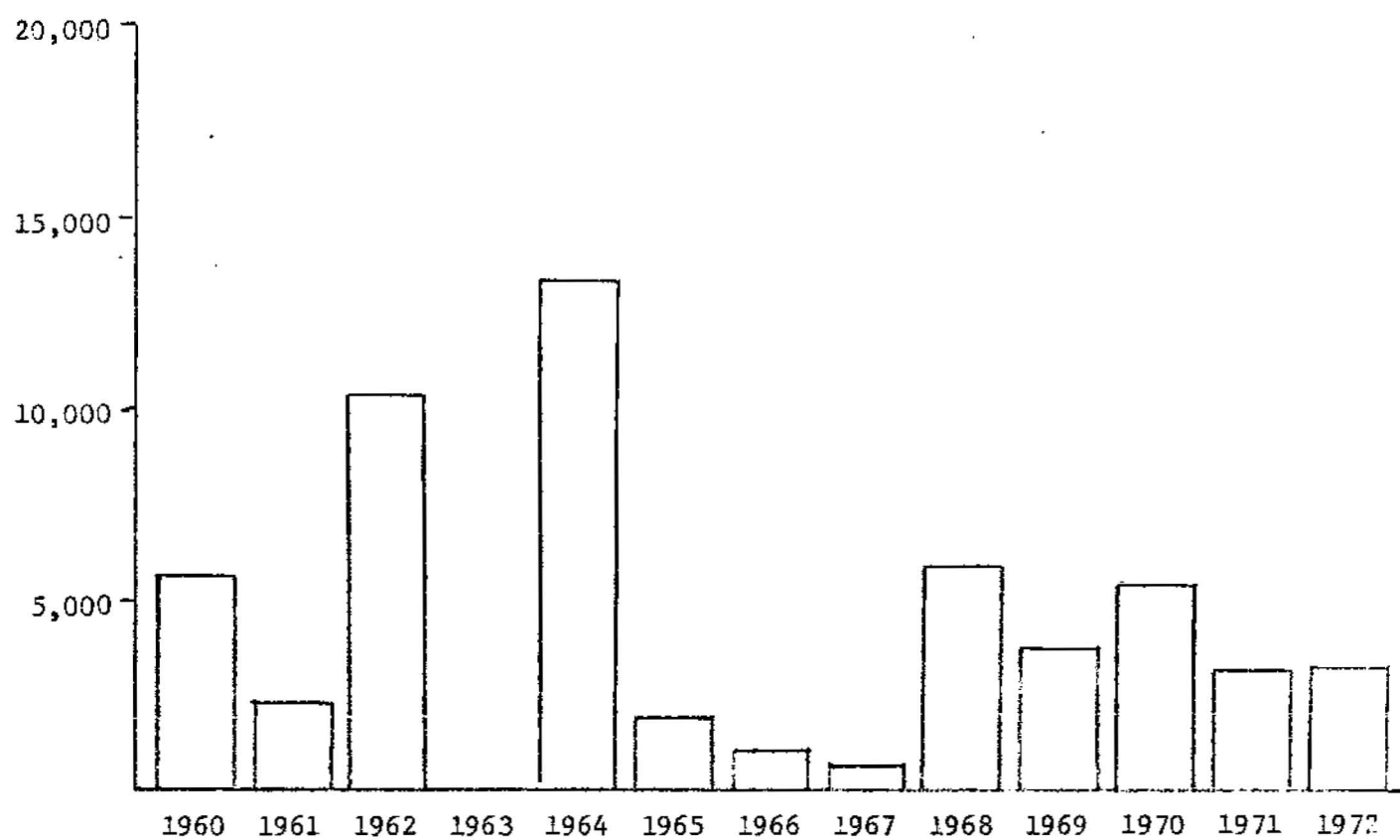
Effort data (since 1961): The red salmon run occurs coincidentally with the king salmon run, thus effort is identical as shown for that species (Figure 5).

Escapement data: Red salmon passing through the commercial fishing area spawn in the Kanektok and Arolik River systems. The majority spawn in Lake Kagati, located in the headwaters of the Kanektok River. Kanektok River system escapement data is presented for 1959-1972 in Table 9. With the exception of the 1961 and 1962 counts obtained by counting tower, the other counts are from aerial surveys and are minimal estimates. These data indicate that post-1964 escapements have been smaller than those during 1959-1963.

Status related to MSY: Although there is insufficient information available to determine MSY, a small harvestable surplus (compared to recent harvests) probably exists.

Management and research strategy: Tagging studies have shown that a majority of red salmon passing through this fishery are bound for local streams and not the Kuskokwim River.

Figure 7. Historical Quinhagak red salmon commercial catches, 1960-1972.



Minimal harvests of red salmon have occurred due in part to the persistent operation of large mesh gill nets for king salmon. A regulation providing for a six-inch mesh size for the entire commercial fishing season will become effective beginning in 1973. This should result in larger harvests of red, chum and pink salmon.

Funding and personnel requirements to better manage this fishery are discussed under "king salmon."

Economic status: The value of the commercial fishery to the fishermen (based on the recent 5-year average catch, 1968-1972, x the most recent price paid per fish of \$1.67) is \$7,200. The potential value is estimated to be closer to \$14,000.

Table 8. Historical Quinhagak commercial red salmon catches, 1960-1972

Year	Red Salmon
1960	5,649
1961	2,308
1962	10,313
1963	0
1964	13,422
1965	1,886
1966	1,030
1967	652
1968	5,884
1969	3,784
1970	5,393
1971	3,118
1972	3,286

Table 9. Kanektok River system red salmon escapement data, 1959-1972.

Year	Lake Kagati		Three Unnamed Lakes ^{2/}		Total Red Salmon
	Survey Rating	Red Salmon	Survey Rating	Red Salmon	
1959	Good	102,500			102,500
1960	Good	77,000			77,000
1961	-	22,000	Fair	3,000	25,000
1962	-	18,564			18,564
1963					
1964	Good	80,000			80,000
1965	Fair	8,365	Poor	200	8,565
1966	Good	11,305	Good	920	12,225
1967	Fair	1,900	Good	1,940	3,840
1968	Fair	19,400	Fair	2,800	22,200
1969	Fair	5,600	Fair	1,850	7,450
1970	Fair	9,475	Fair	1,400	10,875
1971	Poor	2,330	Good	8,100	10,430
1972	Fair	6,800	Fair	175	6,975

1/ All counts from aerial surveys except Lake Kagati counts for 1961 and 1962, which were obtained by counting tower.

2/ Three small lakes located approximately 3 miles downstream from Lake Kagati outlet.

REGION NORTHERN
GEOGRAPHICAL MANAGEMENT UNIT QUINHAGAK (sub-area 335-40)
SPECIES PINK SALMON

Historical harvest data: Pink salmon are taken incidentally when fishing for other species and most years are of minor importance. The largest runs occur during even years.

The largest commercial catch of 75,818 was made in 1968, but 95 percent were males and of little value to a roe-oriented market. The recent 5-year commercial catch average has been 18,771 fish compared to the 10-year average of 9,506 (Table 10). A particularly harsh winter during 1970-1971 is thought to have had a severe impact on recent runs.

The numbers of pink salmon taken for subsistence purposes are extremely small.

Effort data (since 1960): Effort data is similar to that shown for king salmon (Figure 5).

Escapement data: Good comparative escapement data is lacking. One million pinks were estimated to have spawned in the Kanektok River in 1968. In 1970 the Arolik River escapement was judged to range between 150,000-250,000 fish.

Status related to MSY: There is insufficient data available to calculate the MSY for this species. During especially large runs, such as occurred in 1968, in excess of 500,000 pinks could have been harvested commercially.

Management and research strategy: It is apparent that great fluctuations occur in annual abundance. Maximizing harvests during years of extremely high abundance could jeopardize conservation of the other species unless a selective means of harvest could be implemented. In response to this, allowing

beach seining within local rivers or small meshed gill nets in the fishery may be desirable.

Funding and personnel requirements to better manage this fishery are discussed under "king salmon."

Economic status: The value of the pink salmon commercial fishery to the fishermen (based on the most recent 5-year average catch x the most recent price per fish of \$.60) is \$11,000. During years of exceptional abundance, the potential value to the fishermen could approach or even exceed \$300,000.

Table 10. Historical Quinhagak pink salmon commercial harvest data, 1960 - 1972

Year	Pink salmon
1960	0
1961	90
1962	4,340
1963	0
1964	939
1965	0
1966	268
1967	0
1968	75,818
1969	953
1970	15,195
1971	13
1972	1,878

REGION NORTHERN
GEOGRAPHICAL MANAGEMENT UNIT QUINHAGAK (sub-area 335-40)
SPECIES CHUM SALMON

Historical harvest data: Table 11 shows historical commercial and subsistence catches dating back to 1961. This same data is graphically presented in Figure 8.

Early commercial catches (through 1968) fluctuated greatly in response to available processing capabilities. Commercial catches since 1961 have ranged from no harvest to 46,556 fish. The recent 10-year average was 16,736 compared to the recent 5-year average of 30,342.

No accurate comparable subsistence data is available prior to 1967; however, observations indicate a decrease in the importance of the subsistence fishery. Catches have ranged from 1,705 to 6,743 fish since 1967 (Figure 8).

Effort data (since 1961): A majority of the chum run occurs during the king salmon run and thus effort data is similar (Figure 8).

The number of subsistence families has varied from a low of 19 to a high of 59 families since 1967 (Figure 8).

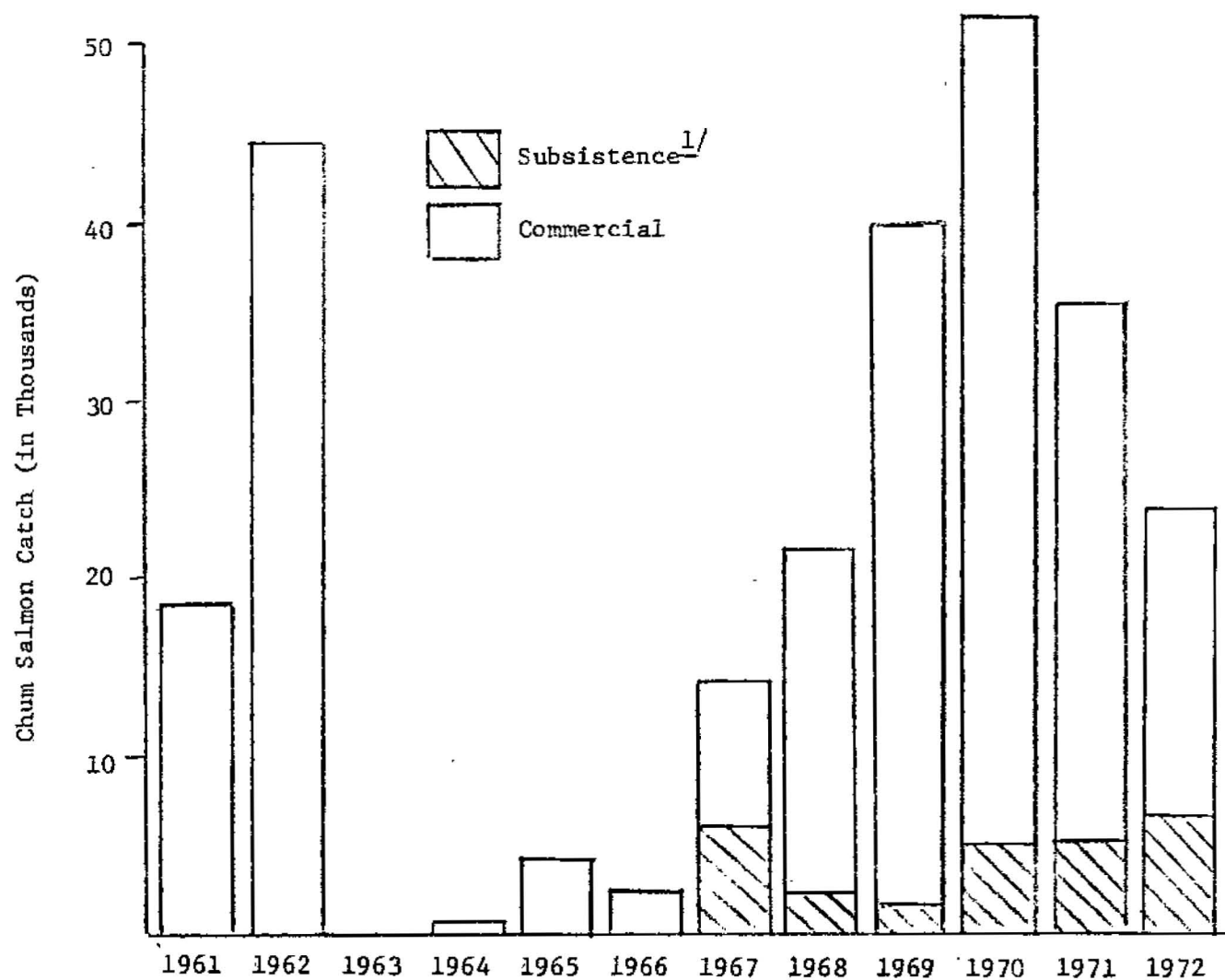
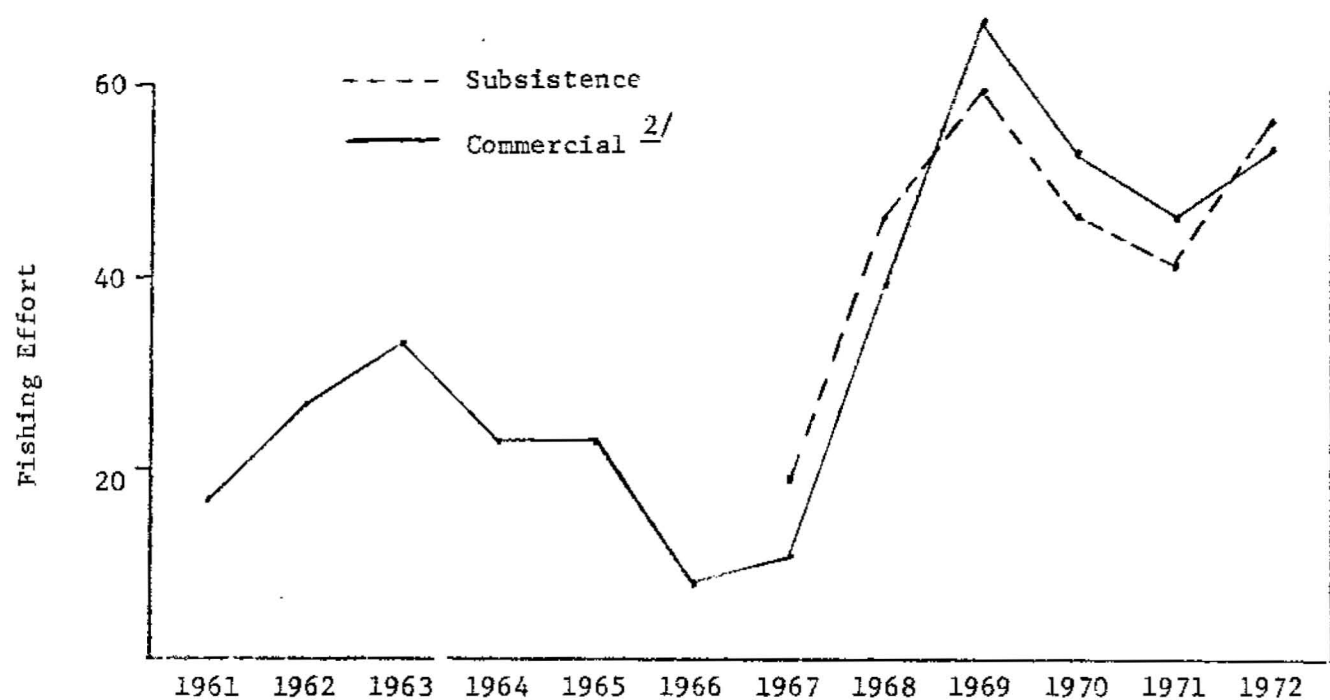
Escapement data: Good comparative escapement data is lacking.

Status related to MSY: No accurate MSY has been formulated; however, present levels can probably be maintained without damaging the run.

Management and research strategy: Comments made under "red salmon" apply to this species, also.

Economic status: The present value of the commercial fishery to the fishermen (based on recent 5-year average catch x most recent price paid per fish of \$1.14) is \$35,000.

Figure 8. Quinhagak chum salmon catch and effort data, 1961-1972.



1/ Contains small number of reds, cohos and pink salmon.

2/ Number of vessel licenses

Recent subsistence catches have averaged 31,000 pounds (round weight) annually. Most of this catch is utilized as dried fish with a processed weight of 6,200 pounds. If a similar amount of protein would have to be purchased locally at \$1.00 per pound, then the value of the subsistence fishery is estimated at \$6,200.

Table 11. Quinhagak historical chum salmon commercial and subsistence catches, 1961-1972.

Year	Commercial	Subsistence ^{1/}	Total
1961	18,864		18,864
1962	45,707		45,707
1963	0		0
1964	707		707
1965	4,242		4,242
1966	2,610		2,610
1967	8,087	6,023	14,110
1968	19,497	2,209	21,706
1969	38,206	1,705	39,911
1970	46,556	5,068	51,624
1971	30,208	5,103	35,311
1972	17,247	6,743	23,990

^{1/} Includes small numbers of red, coho and pink salmon.

REGION NORTHERN
GEOGRAPHICAL MANAGEMENT UNIT GOODNEWS BAY (sub-area 335-50)
SPECIES KING SALMON

Historical harvest data: There is no record of any commercial fishery in this area prior to 1968. Traditionally, male residents worked or fished in Bristol Bay during the commercial fishing season. A market for local fish became available in 1968 along with processing facilities, although king salmon were not taken commercially until 1969. Annual commercial catches shown in Table 12 have ranged from 264 to 7,163, averaging 2,970. Fluctuations in annual catches were mainly the result of changes in fishing effort and availability of processing facilities.

Subsistence fishing is apparently not as important in the Goodnews Bay sub-area as in the remainder of the area. Subsistence surveys were conducted in 1971 and 1972 when a total of only 504 king salmon was reported.

Effort data (since 1968): The numbers of registered commercial gear holders have varied between 14 and 42 fishermen during the king salmon run for a recent 4-year average of 27 fishermen.

A total of 17 and 14 subsistence fishing families reported catches in 1971 and 1972 respectively.

Escapement data: The remoteness of this area, poor weather conditions and insufficient funding have precluded gathering of the required escapement information.

Status related to MSY: There is insufficient information to reasonably determine MSY.

Management and research strategy: Commercial fishing regulations are nearly identical to those in effect for the Quinhagak sub-area. The commercial

king salmon fishing season is opened at the same time as the Quinhagak fishery for two 12-hour periods per week. Fishing time is generally increased after the king salmon have reached the spawning rivers so the more abundant other species may be more greatly utilized.

Increased funding (including personnel) requested for the Quinhagak fishery could also be used to upgrade management of this fishery. The lower Goodnews River is normally clear throughout the spawning run and accurate escapement enumeration could be obtained from a counting tower.

Economic status: The present value of the commercial fishery to the fishermen (based on a recent 4-year average x the most recent price per fish of \$8.50) is \$25,000.

REGION NORTHERN
GEOGRAPHICAL MANAGEMENT UNIT GOODNEWS BAY (sub-area 335-50)
SPECIES COHO SALMON

Historical harvest data: Coho salmon were first commercially harvested in this area in 1968 when 5,485 fish were landed. The run generally begins in earnest during the first week of August and continues for the better part of the month. Annual commercial catches since 1968, shown in Table 12, have ranged from 925 to 11,631 averaging 5,321. Annual catch fluctuations were mainly the result of changes in fishing effort and the availability of processing facilities.

Cohos are the most sought after salmon for subsistence purposes. Subsistence fishing begins after the commercial season ends, which is usually in August when the cohos are the most abundant salmon species. A total of 1,121 subsistence cohos was reported in 1972.

Effort data (since 1968): The number of commercial fishermen during the coho run has varied between 8 and 29 fishermen; the recent 5-year average was 17 fishermen.

Escapement data: Valid escapement data is lacking for coho salmon. The lateness of the run coincides with the end of the Department's field season.

Status related to MSY: No information is available.

Management and research strategy: Commercial fishing time during the coho run is frequently extended by emergency order to compensate for lost fishing time due to severe storms. Reference to an expanded management program is discussed under "king salmon."

Economic status: The present value of the commercial fishery to the fishermen (based on the recent 5-year average catch x the most recent price per fish of \$2.00) is \$10,500.

REGION NORTHERN

GEOGRAPHICAL MANAGEMENT UNIT GOODNEWS BAY (sub-area 335-50)

SPECIES RED SALMON

Historical harvest data: The red salmon run overlaps the king and chum salmon runs. This species is landed incidentally to the kings, however, the catches increase as the large mesh king gear is exchanged for the smaller chum salmon gear. Commercial catches since 1969 have ranged from 330 to 7,144, averaging 3,663 (Table 12). Catch fluctuations were mainly the result of changes in fishing effort and availability of processing facilities.

The number of red salmon harvested for subsistence purposes is unknown, however, the number is thought to be small as subsistence fishing is not very important in this sub-area.

Effort data (since 1969): The commercial and subsistence effort data is identical to that for king salmon.

Escapement data: There are nine known red salmon spawning lakes in the Goodnews River system. Some comparative escapement data is available for Goodnews Lake, one of the more important spawning areas (Table 13). Inclement weather and the remoteness of the area limit the effectiveness of aerial surveys that are used to assess escapement.

Status related to MSY: Insufficient information is available.

Management and research strategy: Minimal commercial harvests of red salmon have occurred, due in part to the persistent operation of large mesh gill nets for king salmon. A regulation providing for a maximum six-inch mesh size for the entire commercial fishing season will become effective beginning in 1973. This should result in larger harvests of red as well as chum and pink salmon.

Funding and personnel requirements to better manage the fishery are discussed under "king salmon."

Economic status: The present value of the commercial fishery to the fishermen (based on the recent 4-year average catch x the most recent price paid per fish of \$2.90) is \$10,500.

REGION NORTHERN
GEOGRAPHICAL MANAGEMENT UNIT GOODNEWS BAY (sub-area 335-50)
SPECIES PINK SALMON

Historical harvest data: Pink salmon are captured incidentally when fishing occurs for king, red and chum salmon. Pink salmon in this sub-area appear to exhibit an even-year cycle.

Commercial catches since 1969, shown in Table 12, have ranged from no catch to 12,183, averaging 3,137. A particularly harsh winter during 1970-1971 is thought to have had a severe impact on recent runs.

The numbers taken for subsistence purposes are extremely small with only 66 reported in 1972.

Effort data: Effort data for commercial and subsistence fishing is identical with that for kings.

Escapement data: Little information is available. Poor weather conditions often make species identification difficult during aerial surveys as three other species are also present. In excess of 112,000 pinks were observed spawning in 1970 in the upper ten miles of the Goodnews River.

Status related to MSY: Although there is insufficient information to determine MSY, commercial catches during peak years of abundance (e.g., 1970) could have been substantially increased.

Management and research strategy: Comments made under "Quinhagak pink salmon" also apply to this sub-area.

Economic status: The present value of the commercial fishery to the fishermen (based on recent 4-year average x most recent price paid per fish of \$.73) is \$2,300. The potential value is probably considerably greater.

REGION NORTHERN
GEOGRAPHICAL MANAGEMENT UNIT GOODNEWS BAY (sub-area 335-50)
SPECIES CHUM SALMON

Historical harvest data: Fluctuations in commercial catches have been mainly the result of changing fishing effort and the availability of adequate processing facilities. Commercial chum salmon catches since 1969, shown in Table 12, have ranged from 301 to 12,346, averaging 4,746. Chum salmon do not appear to be as abundant as in most other areas of the northern region.

Only 300 fish were reported taken for subsistence purposes in 1972.

Effort data: The chum run occurs coincidentally with most of the king run, so effort is similar to that presented under "king salmon."

Escapement data: Good annual comparative escapement data is lacking. Aerial survey counts made in the main Goodnews River have ranged as high as 8,500 fish.

Status related to MSY: Insufficient information is available.

Management and research strategy: Comments made under "red salmon" also apply to this species.

Economic status: The present value of the chum salmon commercial fishery to the fishermen (based on the recent 4-year average catch x the most recent price paid per fish of \$1.15) is \$5,500.

Table 12. Goodnews Bay historical commercial salmon catches, 1968-1972.

Year	King	Red	Coho	Pink	Chum	Total
1968			5,485			5,485
1969	3,978	6,256	11,631	298	5,006	27,169
1970	7,163	7,144	6,794	12,183	12,346	45,630
1971	477	330	1,771	0	301	2,879
1972	264	924	925	66	1,331	3,510

Table 13. Goodnews Lake red salmon escapement data,
1959-1971 (from aerial surveys).

Year	Survey Rating	Red Salmon
1959	-	10,000
1960	-	3,400
1961	-	1,000
1966	Good	818
1967	Good	2,400
1968	Fair	7,310
1969	Good	32,000
1970	Fair	800
1971	Poor	2,056

REGION NORTHERN

GEOGRAPHICAL MANAGEMENT UNIT YUKON AREA (334)

SPECIES SALMON

REGION NORTHERN

GEOGRAPHICAL MANAGEMENT UNIT YUKON AREA (334)

The Yukon area, the largest management unit in the state, includes all waters of the Yukon River drainage in Alaska and all coastal waters from Cape Stephens, including Stuart Island, southward to 62° North Latitude (Figure 9). The Yukon River originates in British Columbia within 30 miles of the Gulf of Alaska and flows over 2,300 miles to its mouth on the Bering Sea draining an area of approximately 330,000 square miles.

The Yukon River in Alaska is divided into four sub-areas for commercial salmon fishery management and regulatory purposes. These are sub-areas 334-10 (Yukon River delta), 334-20 (lower Yukon River), 334-30 (middle Yukon River) and 334-40 (upper Yukon River and the Tanana River). For exact locations of these sub-areas see Figure 9. The major commercial fisheries are found in the lower 150 miles, although limited commercial fishing is widely dispersed over 1200 river miles in the upper Yukon and lower Tanana Rivers. Tributary streams of the Yukon and Tanana Rivers are closed to commercial fishing. With the possible exception of a few fish taken at the mouth or adjacent coastal villages, only salmon of Yukon River origin are harvested in the area.

All five species of salmon are indigenous to the area with chum salmon being the most abundant. King salmon rank second in abundance followed in order by coho, pink and sockeye salmon. The latter two species are found in limited numbers and there is no significant fishery for them.

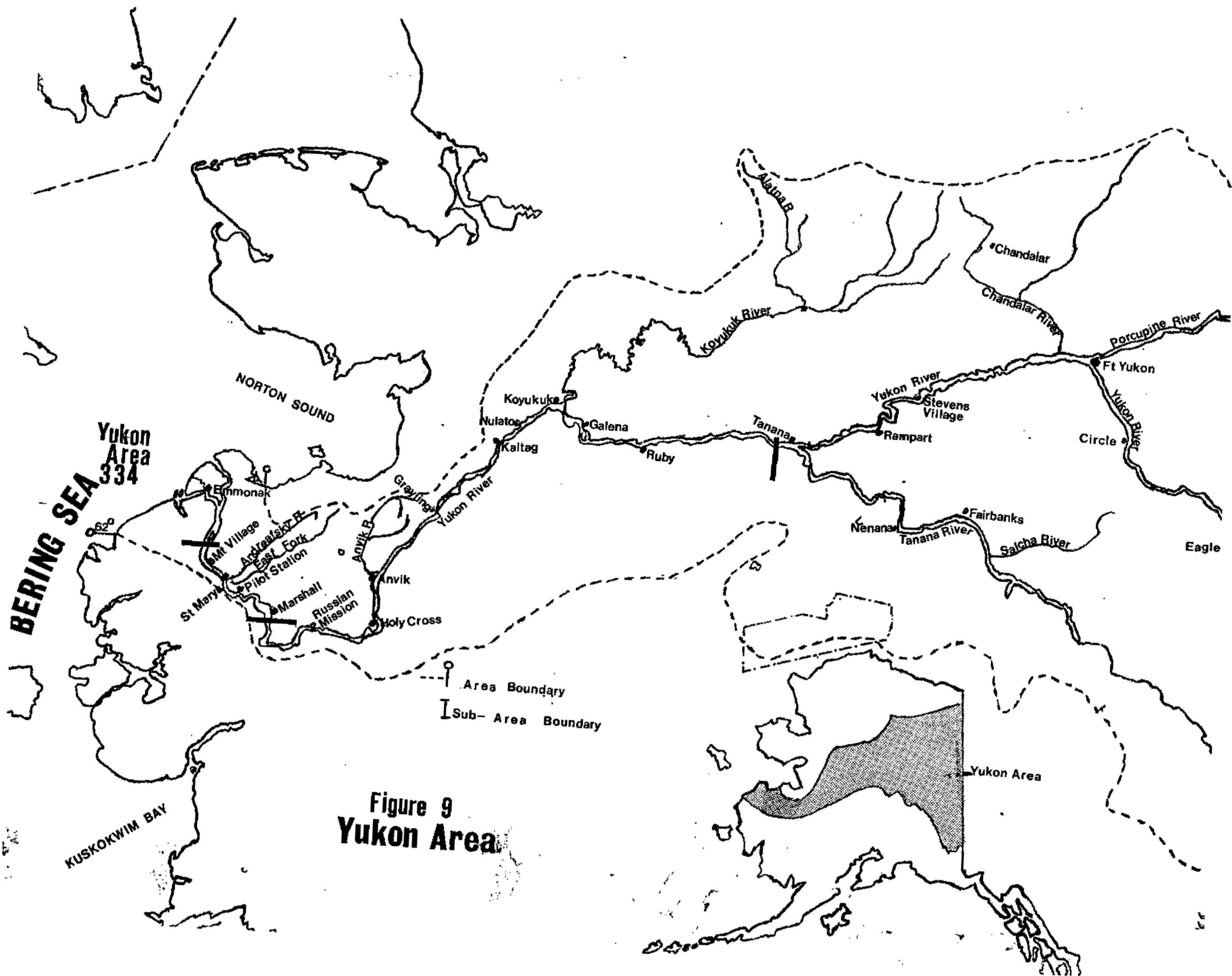
King salmon and a few incidentally captured summer chum salmon are taken primarily during June when a majority of commercial fishermen use gill nets of 8 1/2 inch stretched mesh. Commercial fishing is closed in early July to insure

adequate king salmon escapement. The commercial fishing season is reopened by mid-July and lasts through August when fishermen operate small mesh nets for fall chum and coho salmon.

Set gill nets account for about 75 percent of the present commercial harvests, although use of drift gill nets is steadily increasing. Limited use of fish-wheels is made, especially in the upper river. The vast majority of commercial fishermen are Eskimo and Indian residents of the Yukon River drainage. Most of these fishermen operate small (16-20 ft.) outboard-powered skiffs and do not use net rollers or powered reels of any type.

The majority of the commercial catch is frozen by floating processing ships. The remainder of the catch is either canned, mild-cured, hard salted or sold fresh. The production of salmon roe for food and bait is gradually becoming of importance.

Although still an important form of utilization, subsistence salmon catches, especially chums, have declined markedly in recent years. Comprehensive surveys of this fishery have been made annually by the Department since 1961. For the most part surveys made prior to 1961 were poorly documented and their accuracy is suspect.



REGION NORTHERN

GEOGRAPHICAL MANAGEMENT UNIT YUKON AREA (334)

SPECIES KING SALMON

Historical harvest data: The intensive Yukon River king salmon commercial fishery has been in progress nearly 50 years. Yukon River king salmon are in great demand due to their exceptional quality (bright color, firm flesh, high oil content). Table 14 presents commercial and subsistence catches dating back to 1918. Except for larger catches made at the onset of the fishery, commercial utilization was at a reduced level prior to statehood (1960). During the period 1918-1924 commercial catches averaged 43,252 kings. The fishery was closed entirely during 1925-31, but during 1932-1953 catches averaged 25,403 kings. During 1954-1960 a 65,000 king salmon quota was in effect for the lower river. Commercial catches during this period averaged 64,952 fish.

The subsistence king salmon catches, reserved mainly for human consumption, have apparently remained relatively stable since the early 1900's. Although catch data is missing or incomplete for some years, the annual king salmon subsistence catch appeared to average 15-20,000 fish prior to statehood.

With the liberalization of regulations (substitution of scheduled weekly fishing periods instead of the 65,000 quota), an increased king salmon commercial catch, extended over a longer season, has resulted since the state assumed management. The 1967 catch of 129,706 kings was the greatest commercial catch ever made in the area. The recent 10-year (1963-1972) average catch is 103,206 kings and the recent 5-year (1968-1972) average is 96,072 kings. Commercial catches since 1961 are shown in Figure 10.

Subsistence catches since statehood have remained stable averaging 16,648

for the last 10 years and 17,165 for the last 5 years. Subsistence catches since 1961 are presented in Figure 10.

Effort data (since 1961): Commercial fishing effort in terms of registered licensed fishing vessels has nearly doubled during 1961-1972, increasing from 350 to 660 (Figure 10). The recent 10-year average has been 526 compared to the recent 5-year average of 569. Also, registration of licensed set gill nets has doubled since statehood while drift gill net license registration has tripled during the same period. The use of fishwheels has also steadily increased in recent years. Effort information prior to statehood is unavailable.

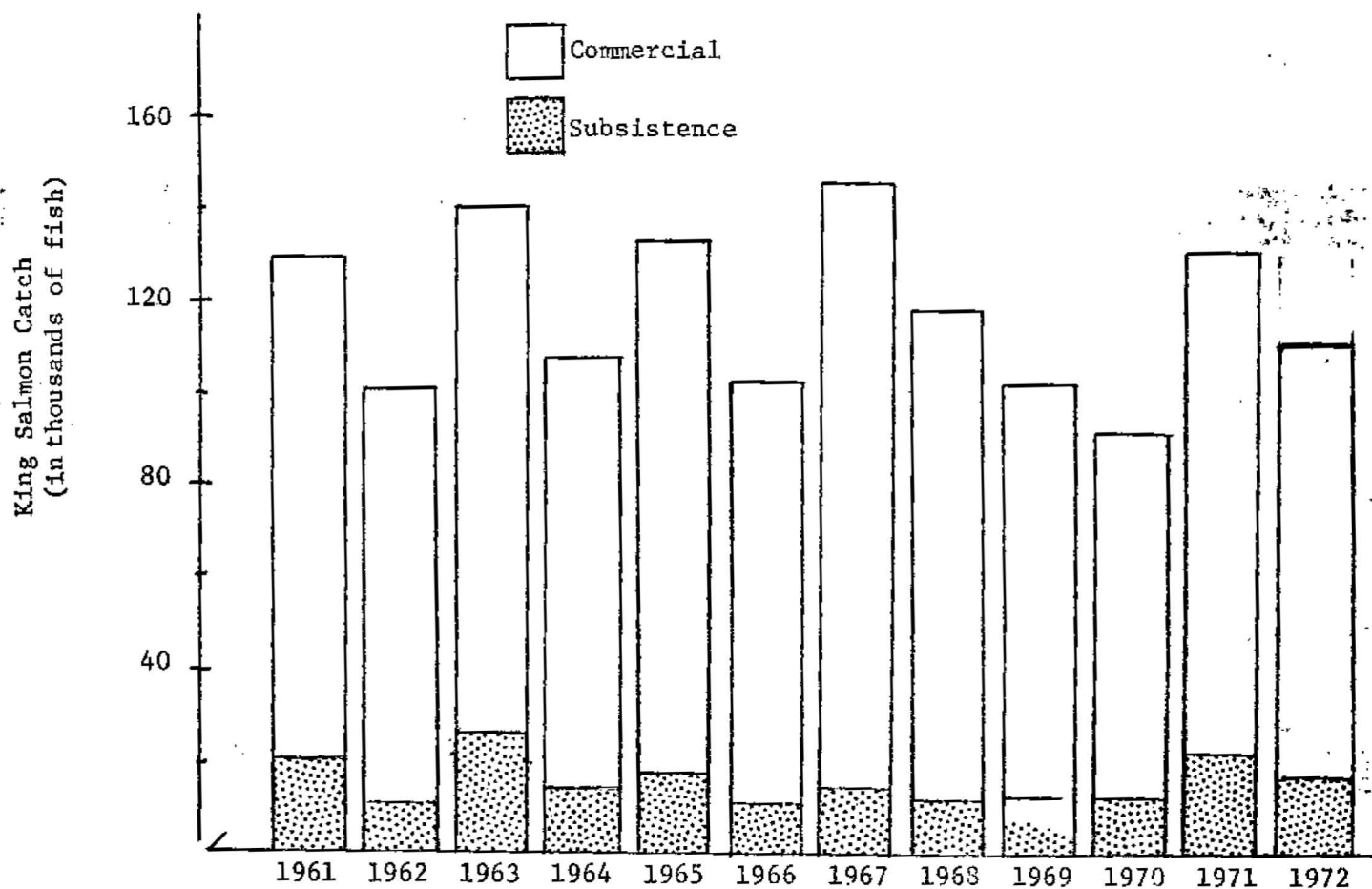
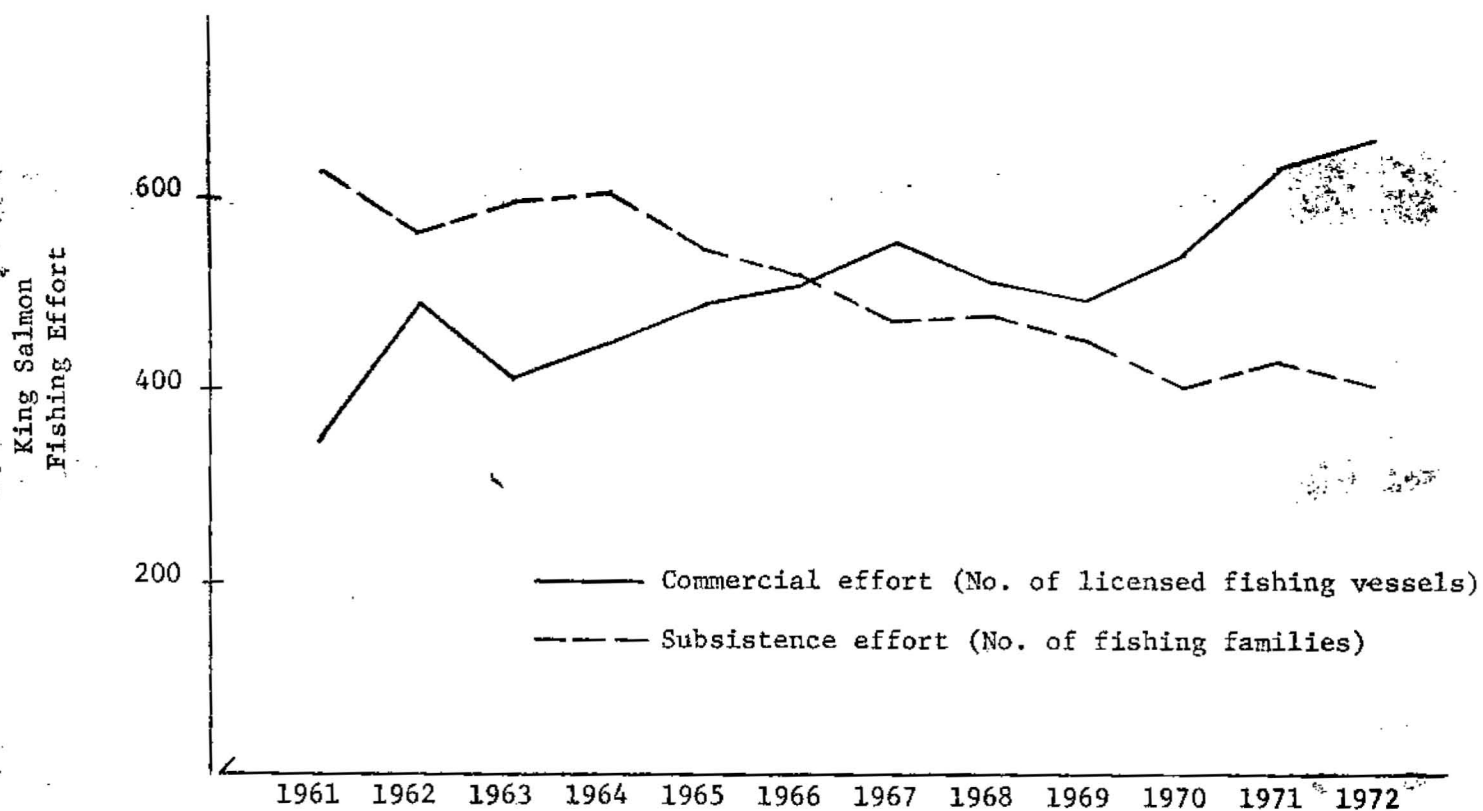
Subsistence fishing effort in terms of numbers of fishing families has ranged from 400 to 624 during 1961-1972 with the recent 10-year average being 487 compared to the recent 5-year average of 433 (Figure 10).

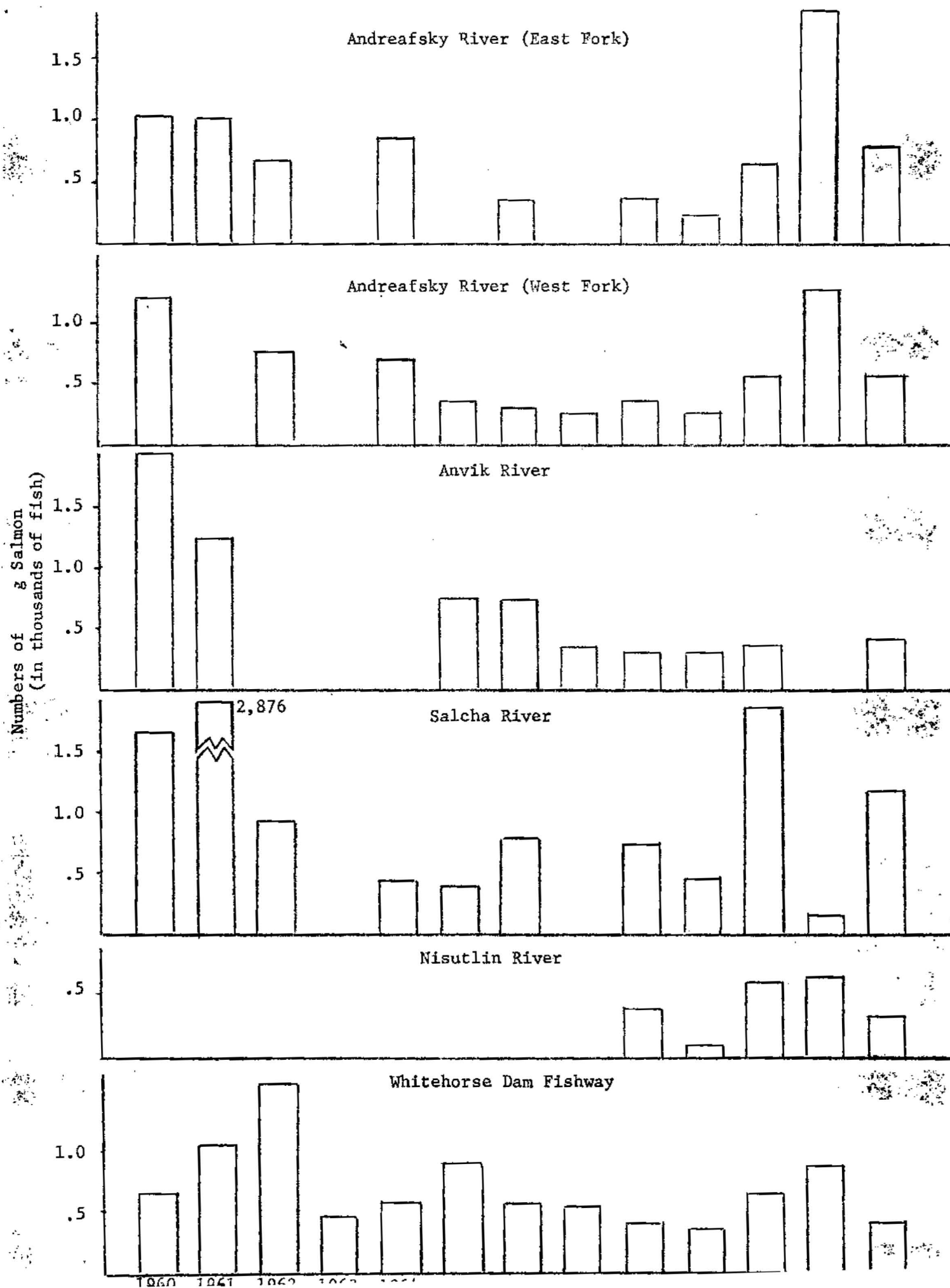
Escapement data: Index counts of king salmon spawners in selected key streams are shown in Figure 11. Escapements were relatively poor in the mid-1960's but have generally improved in recent years.

Status related to MSY: The Yukon River king salmon stocks are probably being harvested at or near the maximum rate by the present commercial and subsistence fisheries. Until future returns can be studied and additional escapement information is obtained, commercial harvests should not normally exceed 90,000-100,000 fish annually. With the inclusion of subsistence catches, MSY is considered to be in the range of 106,000-116,000.

Management and research strategy: Commercial harvests are not allowed to exceed 90,000-100,000 fish until further studies indicate that a larger harvest is justified. Fishing periods are kept short (not more than 48 hours) and are interspersed with closures of similar duration. This spreads the fishing effort throughout more of the run and may prevent overharvesting of particular run segments or races.

Figure 10. Yukon area king salmon catch and effort data, 1961-1972.





Due to increases in commercial fishing effort and efficiency and indications of a trend of declining escapements during the mid-1960's, the following actions have been taken:

1. In 1968 the weekly fishing time during the king salmon season was reduced from 4 to 3 1/2 days a week.
2. In 1970 a commercial king salmon harvest goal was established at 105,000 fish and has been recently revised downward to 90,000-100,000 fish.

Seasonal commercial catch quotas have been established in upriver areas for the purpose of allowing very limited harvests which traditionally have occurred for many years.

Subsistence fishing regulations are generally nonrestrictive except in the lower two sub-areas where subsistence fishing is prohibited during the closed fishing periods of the commercial fishing seasons. Also, subsistence fishing is not allowed in these sub-areas for 24 hours before the opening and following the closure of the season. Due to heavy fishing effort and relatively easy access to fishing areas, permits are required and several area closures are in effect for subsistence fishermen in various portions of the upper river near Fairbanks.

The in-season management of the king salmon commercial fishery is based on the analysis of comparative commercial and test fishing catch data which indicates the relative size of the overall runs and escapements above the main commercial fishing area. The duration of the weekly fishing period and season is occasionally changed by emergency order when unusually small or large runs are indicated or when the harvest goal or quotas are attained.

The long-range goal for management of the Yukon River king salmon stocks is to maintain the present level of harvest until future returns can be evaluated. To accomplish this, an increase in staffing and operational funds is required for both management and research activities. Primary emphasis should be directed toward obtaining additional, accurate escapement information on the quantity and quality of spawners on an annual basis. In order to facilitate in-season management of the lower Yukon commercial fishery, an additional test fishing site is required in the middle mouth to complement the south mouth test fishing operation. Stationing an additional management biologist in Fairbanks would allow greater monitoring of the upriver fishery and its attendant problems.

There are many problems associated with management and research of Yukon River king salmon and the more important of these are:

1. Due to the vast size of the drainage and turbid water conditions, it is impossible to obtain timely, accurate and total escapement data. There is a complete lack of escapement-return information necessary to accurately determine MSY and to predict the magnitude of future runs. The presence or absence of salmon has not been documented for substantial portions of the drainage. Collection of escapement information is at present limited almost entirely to aerial surveys made 2-6 weeks after the run leaves the commercial fishing grounds.
2. In essence the lower Yukon fishery is a "cape fishery" taking unknown proportions of various stocks or races bound for tributaries widely dispersed throughout the drainage. It is possible that the intensive commercial fishery may be over-harvesting certain segments of the run.
3. Fishing effort has doubled and efficiency has increased since statehood. As a result the fleet is capable of harvesting a very large

proportion of the king salmon run in a very short period, thus reducing the management staff's capability to regulate the fishery in order to allow an optimum harvest.

4. Related to the above problem of increased fishing effort and efficiency is the problem of attempting to allow an increased harvest of summer chums during the "king salmon season" and at the same time to maintain the king salmon harvest at present levels.
5. Since there is commercial and subsistence fishing for kings throughout almost the entire length of the main Yukon River in both Alaska and Yukon Territory and a major portion of the Tanana River, there is a very real problem of resource allocation among various user groups. For example, conflicts exist between upriver versus downriver fisheries, Alaskan versus Canadian fisheries and quota versus nonquota fisheries.
6. The intensive commercial fishery is believed to be selective toward certain sized kings, primarily large productive females, and the effect of this on annual escapements and future returns is not completely understood.
7. Another problem encountered in the upriver quota areas (subdistricts 334-30; 334-40) is the failure of fishermen to enter their commercial king salmon catches on fish tickets. These catches are often claimed to be taken for subsistence. Also, salmon roe is probably being sold by subsistence fishermen. These violations are also common in the chum and coho salmon fisheries.
8. Due to oil and mineral development and related activities, alteration and loss of spawning habitat is a potentially serious problem.
9. Finally, the Japanese mothership fishery in the Bering Sea appears

to be intercepting large numbers of western Alaska king salmon. Based on limited tag-recovery and scale morphometry studies, it is indicated that a substantial portion of these high seas catches are composed of Yukon River king salmon stocks. It is estimated that the high seas fishing mortality may be as high as 90,000 Yukon king salmon during some years.

Economic status: The present annual value of the commercial king salmon harvest to fishermen (based on the recent 5-year average catch of 96,072 x most recent year price of \$7.50 per fish) is \$720,500. If high seas interceptions could be eliminated, then the potential value would exceed \$1,000,000.

It is difficult to accurately estimate the economic value of the subsistence fishery. Recent catches have averaged 300,000 pounds (round weight) annually. It is estimated that one-half of this catch is consumed fresh (120,000 pounds dressed weight) with the remainder consumed as smoked fish (37,500 pounds processed weight). If a similar amount of protein would have to be purchased locally at \$2.00 per pound, then the value is estimated at \$315,000.

Recent Developments: Since 1972, two major developments in the Yukon River commercial fishery have occurred. First, record harvests of 517,934 and 877,363 (preliminary data) chums were made in 1973 and 1974 respectively. In contrast to previous years when the chum salmon catch was composed of mainly fall chums, the 1973 and 1974 harvests were comprised of 50 percent and 69 percent summer chums respectively. The increase in the summer chum salmon catch is attributed to increased fishing effort, a doubling of prices paid to the fishermen and above average size runs, especially in 1974 when an exceptionally large run entered the Yukon River.

The second major development was the expansion of the upper Yukon area commercial fishery. New regulations were promulgated by the Board of Fish and Game beginning with the 1974 season to allow increased participation by upriver commercial fishermen. These regulations included dividing the upper river (above the mouth of the Bonasila River) into three subdistricts and allocating separate quotas for each subdistrict totaling 5,000 king and 50,000 fall chum and coho salmon. Quotas were not established for summer chums. In 1974 a total of 4,835 king, 2,888 coho and 108,338 chum salmon were taken by approximately 100 fishermen, double the effort in 1972.

Table 14. Yukon area historical king salmon catches in numbers of fish, 1918-1972.

Year	Commercial	Subsistence	Total
1918	12,239	-	12,239
1919	104,822	-	104,822
1920	58,647	20,000	78,647
1921	69,646	-	69,646
1922	16,825	15,000	31,825
1923	13,393	17,500	30,893
1924	27,375	-	27,375
1925	-	15,000	15,000
1926	-	20,500	20,500
1927	-	-	-
1928	-	-	-
1929	-	-	-
1930	-	-	-
1931	-	26,693	26,693
1932	4,739	23,160	27,899
1933	8,829	19,950	28,779
1934	25,365	-	23,365
1935	7,265	20,400	27,665
1936	20,963	22,750	43,713
1937	6,226	5,528	12,154
1938	13,727	19,244	32,971
1939	9,987	18,050	28,037
1940	18,053	14,400	32,453
1941	29,905	17,703	47,608
1942	22,487		22,487
1943	27,650		27,650
1944	14,232		14,232
1945	19,727		19,727
1946	22,782		22,782
1947	54,026		54,026
1948	33,842		33,842
1949	36,379		36,379
1950	41,808		41,808
1951	56,278		56,278
1952	38,637		38,637
1953	58,859		58,859
1954	64,545		64,545
1955	55,925		55,925
1956	62,208		62,208
1957	63,623		63,623
1958	63,735	11,890	75,625
1959	78,370		78,370
1960	67,597		67,597
1961	119,664	21,488	141,152
1962	94,736	11,110	105,846
1963	117,048	24,862	141,910
1964	93,587	16,171	109,758
1965	118,014	16,608	134,622
1966	93,315	11,572	104,887
1967	129,430	16,448	145,878
1968	106,526	12,106	118,632
1969	90,720	14,000	104,720
1970	79,301	14,310	93,611
1971	110,507	22,451	132,958
1972	92,840	17,931	110,771

REGION NORTHERN

GEOGRAPHICAL MANAGEMENT UNIT YUKON AREA (334)

SPECIES COHO SALMON

Historical harvest data: Coho salmon are of minor importance both in the commercial and subsistence fisheries. Prior to statehood commercial coho salmon catches were reported for only four years: 1918 (26,144), 1919 (37,070), 1921 (1,000) and 1952 (10,863). The 1919 catch of 37,070 fish is the largest catch ever recorded in the history of the fishery. Table 15 presents commercial catches dating back to 1918.

Subsistence catch data is unavailable prior to and since statehood because most fishermen do not distinguish between coho and fall chum salmon.

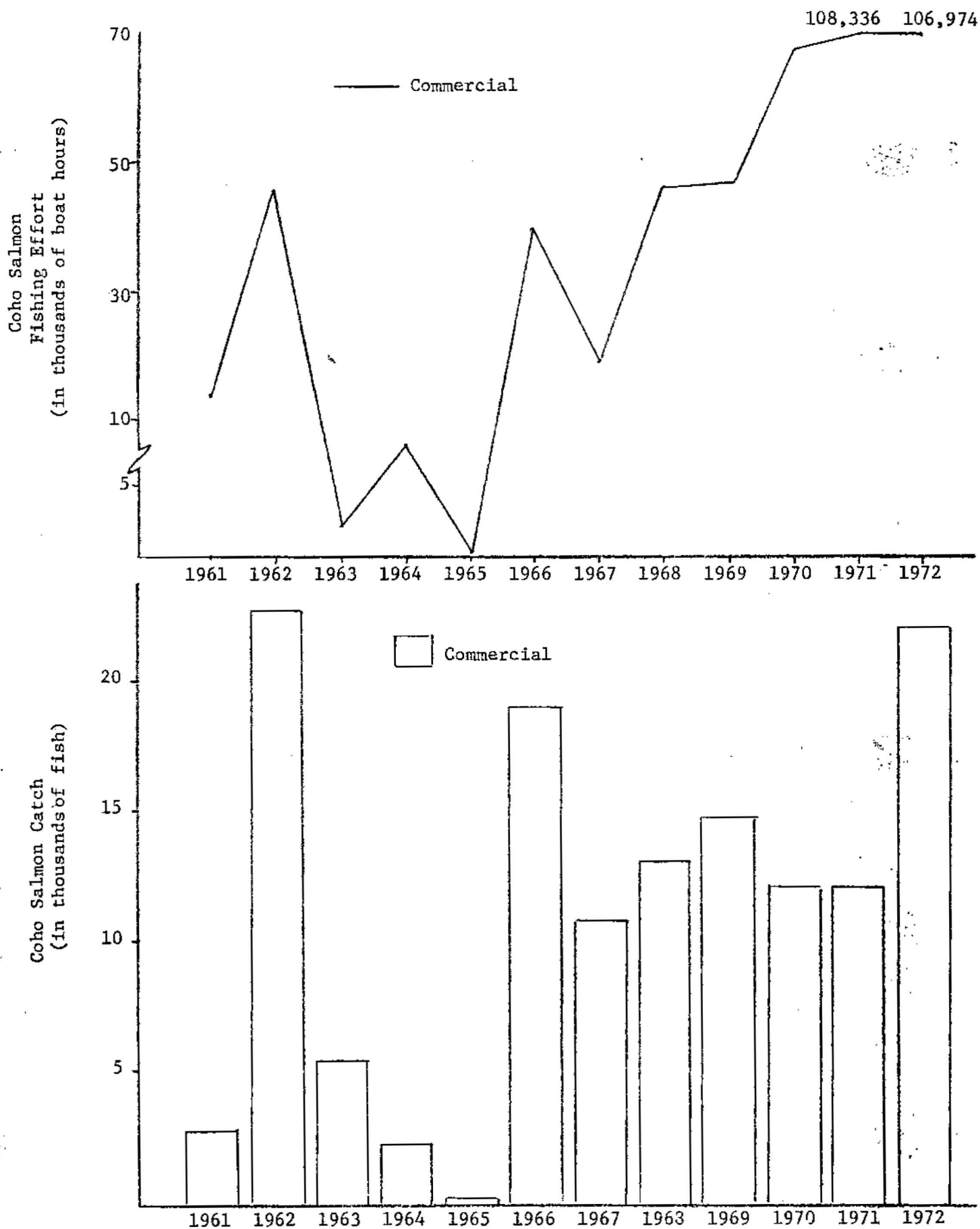
Since statehood the commercial coho salmon catches have ranged from 661 to 23,339 fish. The recent 10-year average (1963-1972) is 11,497 and the recent 5-year average (1968-1972) is 15,201. Commercial catches since 1960 are shown in Figure 12.

Coho salmon first enter the Yukon River about one week later than fall chums and the harvest of this species is dependent on fishing effort for the more numerous fall chums. Yukon River coho salmon are of high quality and uniform in size (average weight of seven pounds).

Effort data (since 1961): Commercial fishing effort for cohos, assumed identical for that of fall chums, is presented in Figure 12.

Status related to MSY: It is believed that the present level of commercial catches, 15-20,000 fish, probably represents the maximum sustained yield. Future expansion of the coho salmon fishery appears unlikely.

Figure 12. Yukon area coho salmon catch and effort data, 1961-1972.



Management and research strategy: Due to their lesser abundance, coho salmon will remain as an incidental species captured during the fall chum salmon fishery. Also, increased research information regarding size of runs and escapements will accrue incidentally from studies planned for fall chum salmon.

Economic status: The present value of the commercial coho salmon harvest to fishermen (based on the recent 5-year average catch of 15,201 x most recent year price per fish of \$1.12) is \$17,000.

Table 15. Yukon area historical commercial coho salmon catches in numbers of fish, 1918-1972.

Year	Commercial Catch
1918	26,144
1919	37,070
1921	1,000
1952	10,868
1961	2,855
1962	23,339
1963	5,575
1964	2,430
1965	661
1966	19,254
1967	11,074
1968	13,303
1969	15,076
1970	13,188
1971	12,203
1972	22,233

REGION NORTHERNGEOGRAPHICAL MANAGEMENT UNIT YUKON AREA (334)SPECIES CHUM SALMON

Historical harvest data: Table 16 presents commercial and subsistence catches dating back to 1918. The commercial fishery prior to statehood was sporadic with catches being taken only during the period 1918-1921, 1953-1954 and 1956.

Prior to statehood nearly the entire catch of chum salmon for most years was taken by subsistence fishermen. Chum or "dog" salmon have been traditionally fed to sled dogs, many of which were used to haul mail. Although accurate catch records are unavailable, it has been estimated that in excess of one million chums were taken annually in some years for subsistence.

Since statehood the commercial catch of chums has ranged from 8,347 to 347,348. The commercial fishery since 1968 has undergone substantial expansion. The recent 10-year average (1963-1972) has been 138,809 compared to the recent 5-year average (1968-1972) of 236,554, an increase of 70 percent. Commercial catches since 1961 are presented in Figure 13.

Subsistence catches since 1960 have ranged from 133,102 to 481,449 fish and have steadily declined (Figure 13). The recent 10-year average catch was 276,790 fish compared to the recent 5-year average catch of 190,669 fish, a decline of 31 percent.

There are two distinct major runs of chum salmon entering the Yukon River: the summer chums and the fall chums. The summer chums are chiefly characterized by: an earlier run timing (early June-mid-July), mature more rapidly in freshwater, smaller size (6-7 lbs.) and larger population. The fall chum are mainly distinguished by: later run timing (mid-July-mid-September), a

more uniform robust body shape and bright, silvery appearance, larger size (7-8 pounds) and smaller population.

Most of the recent expansion of the chum salmon commercial fishery has been directed toward the fall chums. For example, approximately 75 percent of the total commercial chum catch during the last four years was made during the "fall season."

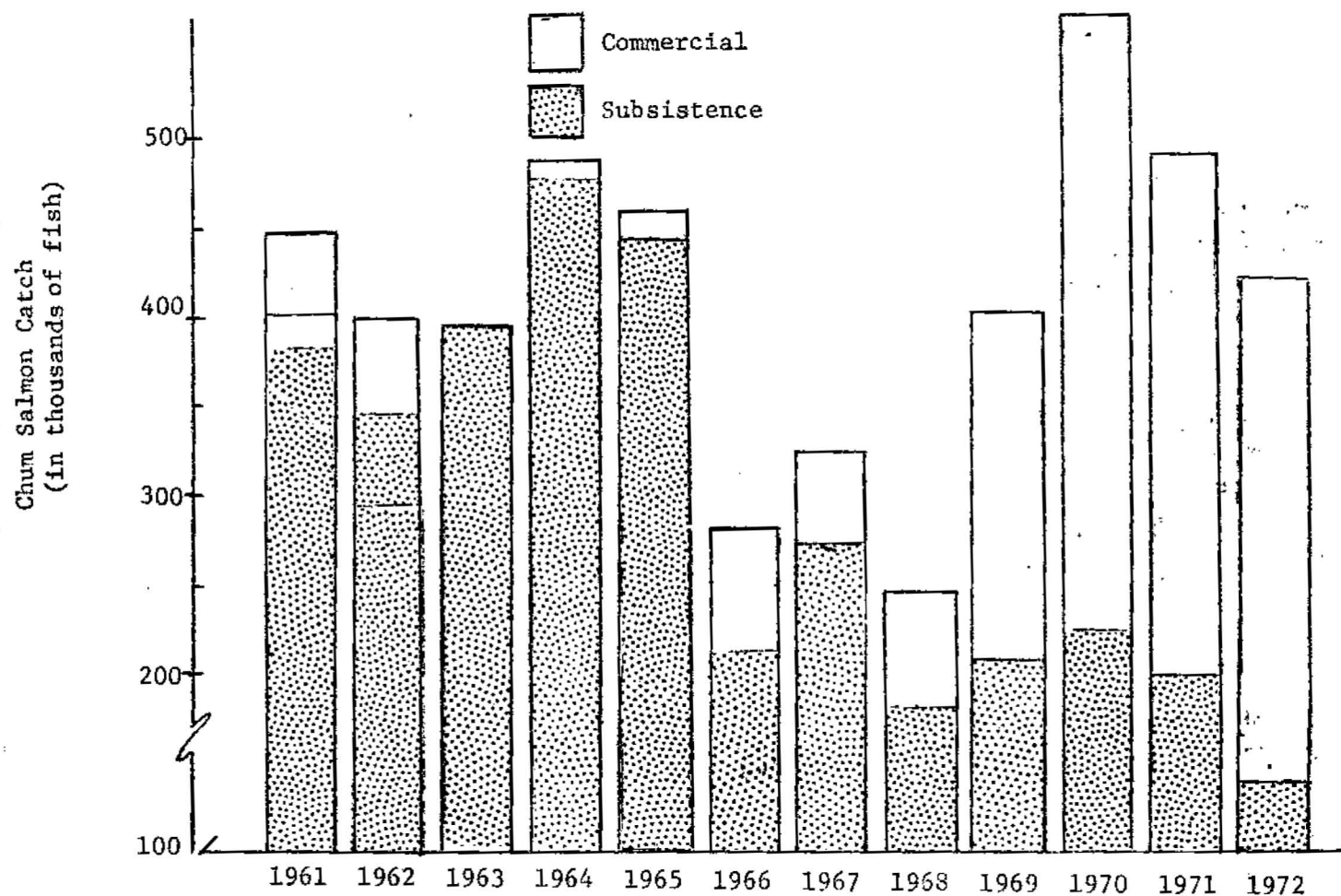
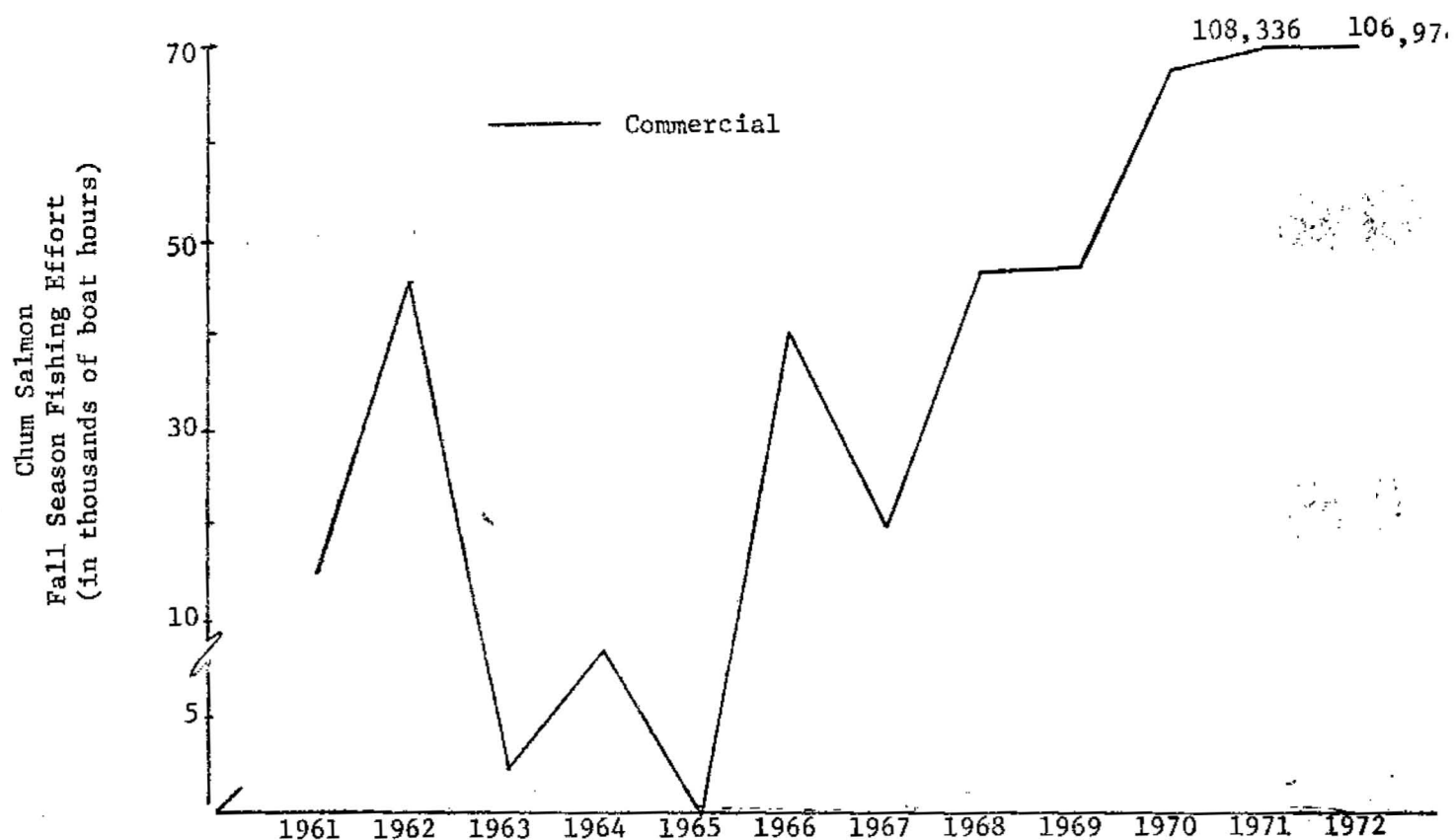
Effort data (since 1961): Due to the recent development of the summer chum salmon commercial fishery, comparable fishing effort is not available. The fall chum salmon commercial fishing effort in terms of thousands of boat hours has ranged from 2,100 to 106,974 during 1961-1972 (Figure 13). The recent 10-year average has been 50,035 compared to the recent 5-year average of 75,721 boat hours.

Subsistence fishing effort in terms of fishing families is identical to that shown in Figure 10 for king salmon.

Escapement data: Comparable counts of summer and fall salmon spawners in selected key streams are presented in Table 17. Escapement levels have been considered good based on the limited number of streams surveyed each year.

Status related to MSY: Summer chum population magnitudes based on tag-recovery programs were estimated at 3.6 million in 1970 and 1.6 million in 1971. Aerial surveys of the Andreafsky and Anvik Rivers during most years indicate minimum escapements of 500,000 summer chums in these two streams. Chum salmon have either been observed or reported spawning in at least 60 other tributary streams.

It is obvious that greater commercial harvests of summer chum salmon can be made as annual catches since 1969 have averaged only 66,000. It is estimated that the summer chum run can sustain a commercial harvest of at least 500,000 fish annually, and this may be substantially increased during years of exceptional abundance.



^{1/} Subsistence effort identical to that shown for king salmon.

There is very little information on which to accurately judge MSY for fall chum salmon. Recent commercial harvest levels of approximately 250,000 annually should be considered MSY until additional information becomes available.

Management and research strategy: As previously indicated, present fall chum commercial catches must be considered approaching MSY. If there is a substantial increase in fishing effort or the magnitude of the run appears below average, then fishing time reductions will be required.

Until recently the summer chum salmon runs were reserved mainly for subsistence utilization. Commercial catch limitations were imposed by fishing season closures and by prohibition of small mesh gill nets. Many of these restrictions have been liberalized during the last four years to allow increased commercial utilization. This decision was influenced by the dramatic decline in subsistence fishing effort and dependence and, more recently, on the indicated size of the summer chum run. Changes in the 1973 regulations (longer fishing season with small mesh gill nets) should result in an increased summer chum catch.

In-season management of the chum salmon fishery is similar to that for king salmon although there is less available data on which to make management decisions due to the brief history of this fishery.

Long-range goals include encouraging the continued development of the summer chum commercial fishery, but maintaining present fall chum harvest levels until future returns can be studied. Research information required includes population size estimates and determination of the quantity and quality of escapements. Similar to king salmon research and management, an increase in operational funds and staffing is necessary.

There are several problems associated with management of the Yukon River chum salmon fisheries including:

1. At present the primary management problem is determining the proper means to provide for an increase in the commercial utilization of the large summer chum salmon run. One of the difficulties affecting the harvest of the summer chums is that the king and summer chum runs occur together in the lower Yukon. Many of the commercial fishermen and processors do not want the long-established and valuable king salmon fishery curtailed even though the value of the harvest of the more abundant chums would exceed any possible small reduction in the king salmon catch. There has been considerable opposition to a recent change in requiring a smaller gill net mesh size during the period late June to early July in the lower two sub-areas.
2. The Japanese mothership fishery in the Bering Sea harvests 2-4 million chums annually. It is believed that the mothership fishery is intercepting large numbers of western Alaska (including Yukon River) chum salmon, although tagging effort in the areas heavily fished by the Japanese has been limited. An intensive tagging program in the Bering Sea should be initiated to determine the degree of interception of western Alaska stocks.
3. Also western Alaska chums, including Yukon River fish, are intercepted by the U.S. South Unimak June fishery as demonstrated by tagging studies. During 1960-72 an average of 228,000 chums was taken annually off South Unimak, but during the past three years, 1970-72, the catches averaged 435,000. Restrictions placed on the South Unimak fishery by the Board of Fish and Game for the 1973 season may result in lower chum salmon catches.
4. Many of the problems which affect management of the Yukon River king salmon also apply to chum salmon, such as: inadequate escapement

information; lack of escapement/return information; resource allocation; unrecorded commercial catches and illegal roe sales in the upper portions of the river.

Economic status: The present annual value of the commercial chum salmon harvest to the fishermen (based on the recent 5-year average catch of 236,554 fish x most recent year price for fish of \$1.05) is \$248,400. If the chum salmon runs were harvested at MSY levels, then the potential commercial fishery value to fishermen (based on recent prices) would range from \$800,000 to \$1,300,000.

It is difficult to accurately estimate the economic value of the subsistence fishery. Recent catches have averaged in excess of 1.3 million pounds (round weight) annually. Many of the chums are dried and fed to sled dogs which decreases their economic value. It is estimated that 13,000 pounds (dressed weight) are consumed fresh by people and 257,400 pounds of dried fish (processed weight) are consumed by both people and dogs. If a similar amount of protein would have to be purchased locally (\$2 per pound for fresh fish and \$1 per pound for dried fish), then the value of the subsistence fishery is estimated at \$285,000.

Table 16. Yukon area historical chum salmon catches in numbers of fish, 1918-1972.

Year	Commercial	Subsistence ^{1/}	Total
1918	73,921	1,400,000	1,473,921
1919	327,898	269,000	596,898
1920	155,655	860,000	1,015,655
1921	111,098		111,098
1922		333,000	333,000
1923		435,000	435,000
1924		1,130,000	1,130,000
1925		259,000	259,000
1926		555,000	555,000
1927		520,000	520,000
1928		670,000	670,000
1929		537,000	537,000
1930		633,000	633,000
1931		565,000	565,000
1932		1,092,000	1,092,000
1933		603,000	603,000
1934		474,000	474,000
1935		537,000	537,000
1936		560,000	560,000
1937		346,000	346,000
1938		340,450	340,450
1939		327,650	327,650
1940		1,029,000	1,029,000
1941		438,000	438,000
1942		197,000	197,000
1943		200,000	200,000
1944			
1945			
1946			
1947			
1948			
1949			
1950			
1951			
1952			
1953	5,977	380,000	385,977
1954	14,375		14,375
1955			
1956	10,742 ^{2/}		10,742
1957			
1958		337,500	337,500
1959			
1960			
1961	42,577 ^{2/}	407,089	449,666
1962	53,766 ^{2/}	349,141	402,907
1963		396,075	396,075
1964	8,347	481,449	489,796
1965	23,211 ^{2/}	448,861	472,072
1966	71,058 ^{2/}	213,186	284,244
1967	49,412 ^{2/}	274,977	324,389
1968	67,375	181,024	248,399
1969	192,582	210,772	403,354
1970	347,348 ^{2/}	225,528	572,876
1971	289,685 ^{2/}	201,533	491,218
1972	287,844	133,102	420,946

^{1/} Mostly chum salmon, but includes small numbers of pink and coho salmon.^{2/} Includes small numbers of pink or red salmon (less than 300).

Table 17. Yukon River comparative chum salmon escapement data, 1958-72 (from peak aerial survey counts unless otherwise noted).

Year	SUMMER CHUMS					FALL CHUMS		
	Andreafsky River (east fork)	Andreafsky River (west fork)	Anvik River	Chena River	Salcha River	Tanana River	Delta River	Porcupine River
1958			100-200,000					
1959			200,000					
1960	3,830		11,110		670			
1961	8,110				1,152			
1962	18,040	19,530	20,600	402	1,161	862	46 ^{1/}	
1963				898				
1964		12,810	12- 14,000 ^{1/}		250 ^{1/}			
1965		14,670 ^{1/}	100,000		2,375			
1966	25,619	18,145	37,500		2,200			
1967		14,495 ^{2/}	116,000					
1968	17,600 ^{2/}	74,600 ^{2/}	51,580 ^{1/}		3,790			
1969	119,000	159,500			425 ^{1/}			
1970	84,090	91,710 ^{1/}	232,780		7,879	800	800	
1971	98,095	71,745			306 ^{1/}			115,000 ⁺
1972	41,460	25,573	245,857 ^{2/}	670	947 ^{1/}	19,657	3,650	35,326 ^{2/}

^{1/} Poor survey conditions.

^{2/} Includes some pinks.

^{3/} Combined tower and aerial survey estimates.

REGION NORTHERN

GEOGRAPHICAL MANAGEMENT UNIT NORTON SOUND (333)

SPECIES SALMON

REGION NORTHERNGEOGRAPHICAL MANAGEMENT UNIT NORTON SOUND (333)

The Norton Sound area includes all waters from Cape Douglas south to Cape Stephens (Figure 14). There are nine major salmon producing streams in the area which is subdivided into six sub-areas to allow for more precise management and reporting of catches. These sub-areas are as follows: 333-10 (Nome), 333-20 (Golovin), 333-30 (Moses Point), 333-40 (Norton Bay), 333-50 (Shaktoolik), 333-60 (Unalakleet). Limited tag recovery information suggests that a majority of salmon captured in any one sub-area are bound for streams in that sub-area.

Commercial fishing was initiated in 1961 and has been characterized by sporadic fishing effort mainly in response to the availability of adequate processing and tendering facilities. The largest harvests were made in 1962-1964 when maximum effort was expended in most sub-areas as a result of the presence of floating cannery vessels. In recent years the majority of salmon have either been flown fresh to Anchorage or have been frozen in local freezer plants.

This is a multi-species commercial fishery with king, pink and chum salmon taken concurrently with the same gear in June and July. Both chum and coho salmon are taken in August. Nearly all of the registered fishermen are local residents with set gill nets being the only legal form of commercial gear which can only be operated in marine waters.

Subsistence fishing for salmon is of lesser importance compared to other areas. Annual subsistence catch surveys have been conducted only since 1963.

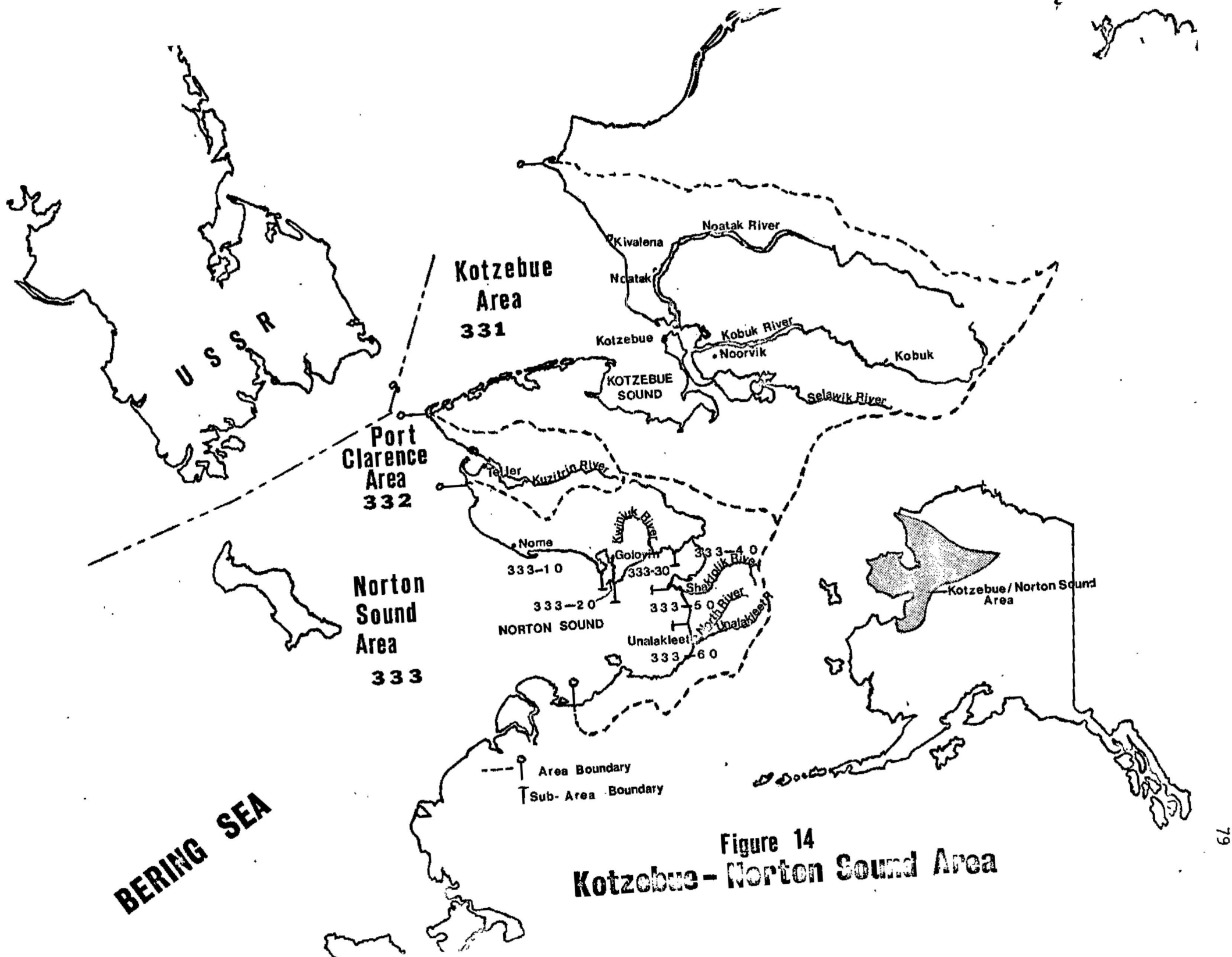


Figure 14
Kotzebue-Norton Sound Area

REGION NORTHERN
 GEOGRAPHICAL MANAGEMENT UNIT NORTON SOUND (333)
 SPECIES KING SALMON

Historical harvest data: Table 18 presents commercial and subsistence catches dating back to the inception of the commercial fishery in 1961. King salmon are present in commercial quantities only in the Unalakleet and Shaktoolik sub-areas. Annual commercial catches have ranged from 1,045 to 7,286 averaging 3,065. The recent 5-year average was 2,153. The largest commercial catches, made during 1961-1963, were influenced by an apparent greater abundance throughout the area and increased effort, especially in the Shaktoolik sub-area.

Annual subsistence catches usually total less than 1,000 fish.

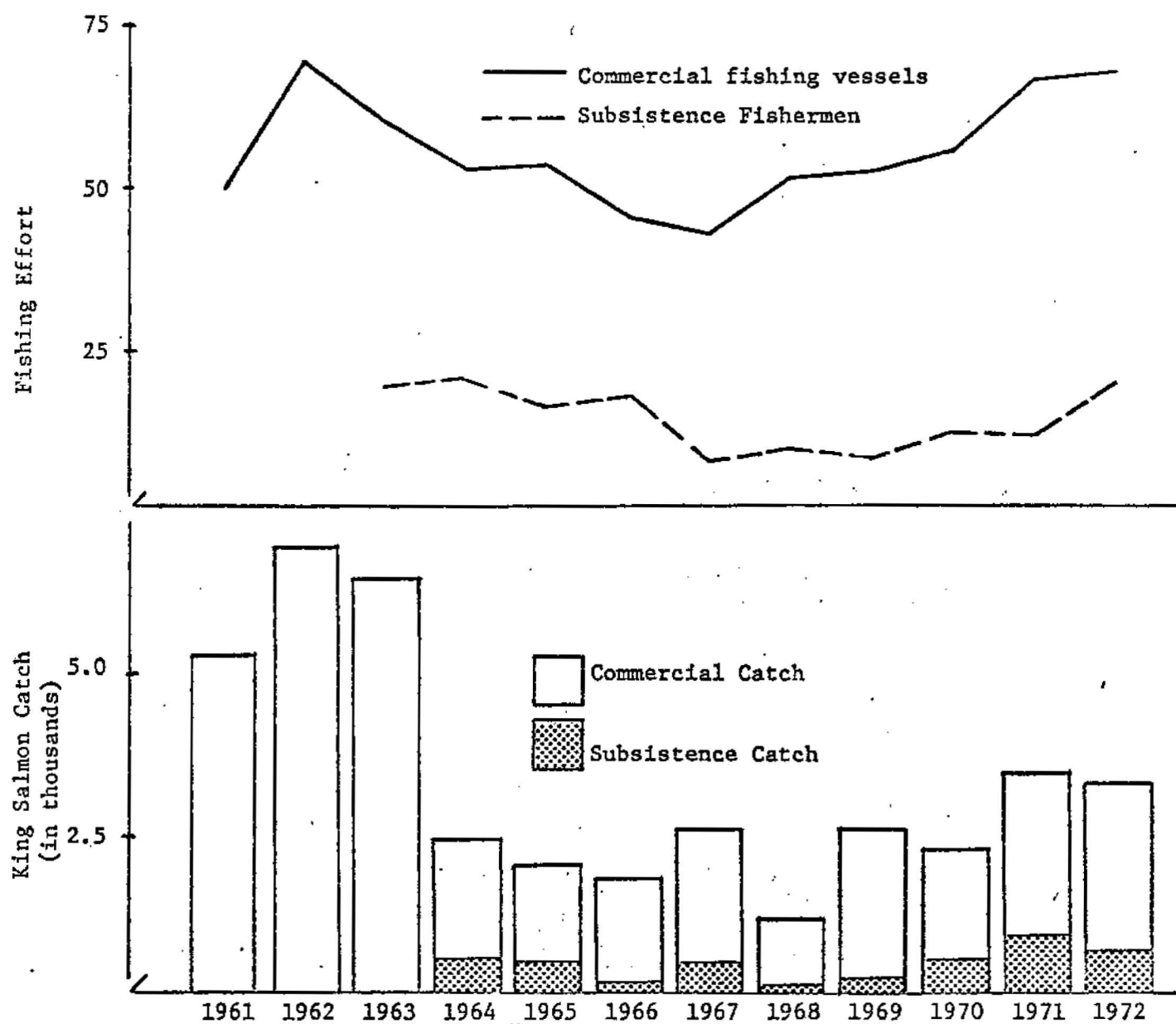
Figure 15 shows commercial and subsistence catches made since 1961 in the Unalakleet sub-area where the greatest utilization occurs.

Effort data (since 1961): Figure 15 shows commercial and subsistence fishing effort made since 1961 in the Unalakleet sub-area.

Escapement data: Escapement information is very limited, although usable escapement information is expected to accrue incidentally to chum and pink salmon studies recently initiated in the Unalakleet River area. In 1972 a total of 575 king salmon was counted at a tower site established on the North River, a tributary of the Unalakleet River.

Status related to MSY: Recent commercial catches must be considered at or near maximum except that a small increase in utilization appears feasible for the Shaktoolik sub-area. Commercial catches for the entire area should not exceed 4,000, with not more than 2,500 coming from the Unalakleet sub-area.

Figure 15. Unalakleet sub-area king salmon catch and effort data, 1961-1972.



02

Management and research strategy: In-season management of this species is a function of the analysis of comparative commercial catch and escapement data. Improved escapement monitoring of the Unalakleet River system, discussed above, will increase future management efficiency. If increased effort for this species occurs in the future, mesh size restrictions could be promulgated to maintain harvests at present levels without interfering with the harvesting of the other species.

Studies are required to identify the origin of king salmon taken in the various Norton Sound coastal fisheries. There is the distinct possibility that Yukon River stocks contribute greatly to the Norton Sound fishery during some years.

Economic status: The present value of the commercial king salmon harvest (based on the recent 5-year average catch x most recent year price per unit) is \$11,562. Although comprising only about two percent of the areawide salmon harvest, prices paid to fishermen have amounted to 15 percent of all salmon sales. Potential value is estimated to be \$20,000.

Recent subsistence catches have averaged 12,000 pounds (round weight) annually. Most of this catch is consumed as fresh fish (9,600 pounds, dressed weight). If a similar amount of protein would have to be purchased locally at \$2 per pound, then the value of the subsistence fishery is estimated at \$19,200.

Table 18. Norton Sound area historical king salmon catches, 1961-1972.

Year	Commercial	Subsistence	Total
1961	5,300	<u>1/</u>	5,300
1962	7,286	<u>1/</u>	7,286
1963	6,613	5	6,618
1964	2,018	565	2,583
1965	1,449	574	2,023
1966	1,553	269	1,822
1967	1,804	817	2,621
1968	1,045	237	1,282
1969	2,392	436	2,828
1970	1,853	561	2,414
1971	2,593	1,026	3,619
1972	2,938	804	3,742

1/ Subsistence catch surveys were not conducted during 1961-1962.

REGION NORTHERN
GEOGRAPHICAL MANAGEMENT UNIT NORTON SOUND (333)
SPECIES COHO SALMON

Historical harvest data: Coho salmon are of minor importance in both the commercial and subsistence fisheries. Table 19 presents commercial and subsistence harvests made in the area since 1961.

Annual commercial catches have ranged from 98 to 16,765, averaging 5,975. The recent 5-year average was 4,344. The vast majority of the commercial harvests have been made in the Unalakleet sub-area. Catches have been unpredictable due to extreme fluctuations in runs and fishing effort. Many fishermen do not fish commercially for cohos during August and September due to inclement weather and the need to participate in subsistence food gathering activities.

Annual subsistence catches since 1963 have ranged from 118 to 4,812, averaging 2,660. The recent 5-year average was 3,056.

Figure 16 shows commercial and subsistence catches made in the Unalakleet sub-area since 1961.

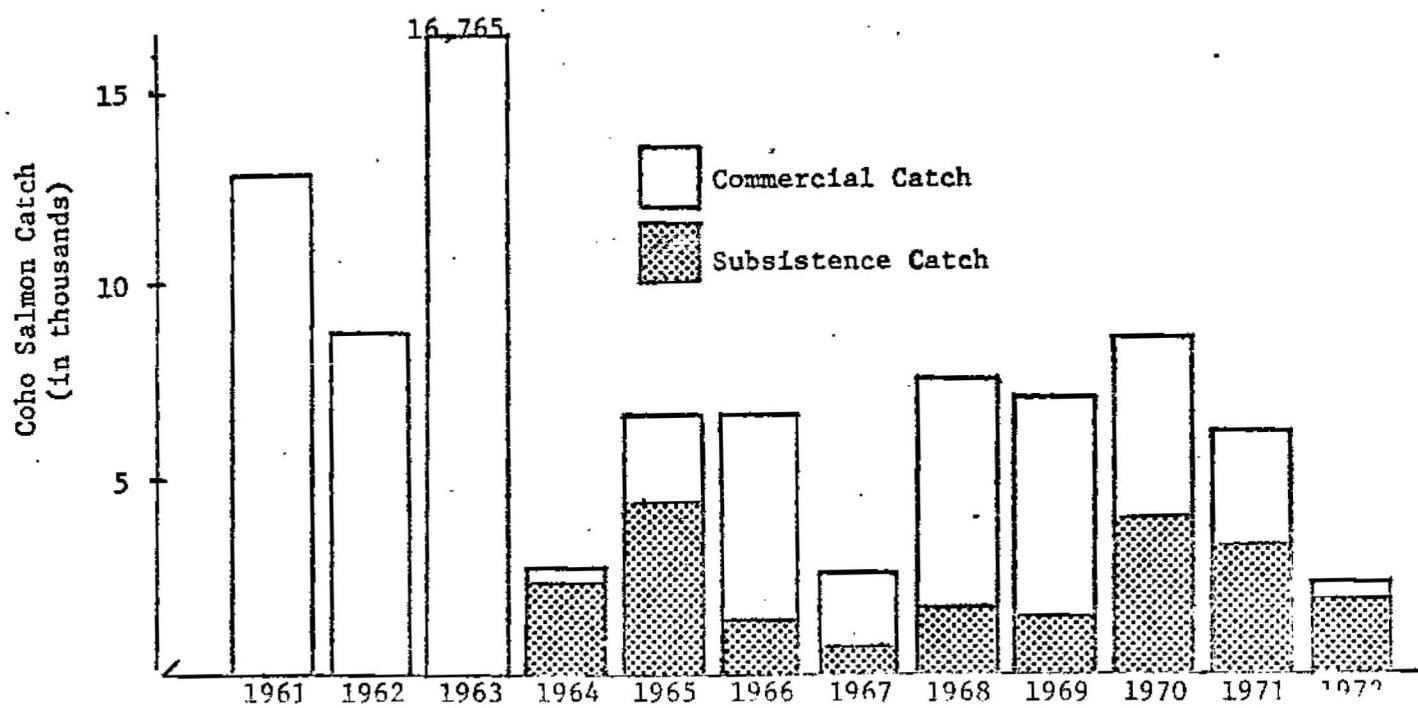
Effort data (since 1961): Commercial and subsistence fishing effort in the Unalakleet sub-area is similar to that for king salmon (Figure 15).

Escapement data: Virtually nothing is known about the numbers and distribution of spawners. Field projects engaged in escapement monitoring have been terminated prior to coho salmon spawning activity.

Status related to MSY: MSY cannot be determined due to data limitations.

Management and research strategy: The coho runs appear to be quite small. Commercial catches will not be allowed to increase over recent levels until studies can be initiated to determine run and escapement parameters.

Figure 16. Unalakleet sub-area coho salmon catches, 1961-1972.



Economic status: The present value of the commercial catch to the fishermen (based on the recent 5-year average catch x most recent price per unit) is \$5,000.

Recent subsistence catches have averaged 21,000 pounds (round weight) annually. Most of these fish are consumed fresh by people (17,000 pounds dressed weight). If a similar amount of protein would have to be purchased locally at \$2 per pound, then the value of the subsistence fishery is estimated at \$34,000.

Table 19. Norton Sound area historical coho salmon catches, 1961-1972.

Year	Commercial	Subsistence	Total
1961	13,807	<u>1/</u>	13,807
1962	9,156	<u>1/</u>	9,156
1963	16,765	118	16,883
1964	98	2,567	2,665
1965	2,030	4,812	6,842
1966	5,755	2,210	7,965
1967	2,379	1,222	3,601
1968	6,885	2,391	9,276
1969	6,836	2,191	9,027
1970	4,423	4,675	9,098
1971	3,127	4,097	7,224
1972	454	2,319	2,773

1/ Subsistence catch surveys were not conducted during 1961-1962.

REGION NORTHERN
 GEOGRAPHICAL MANAGEMENT UNIT NORTON SOUND (333)
 SPECIES PINK SALMON

Historical harvest data: Table 20 and Figure 17 show commercial and subsistence catches made in the area since 1961. Often pink salmon are the most abundant species in the area, yet commercial catches are insignificant. The small commercial harvest is influenced by the lack of demand by local buyers and selectivity for the larger king and chum salmon by the gill net fishery. Commercial catch composition has been about 90 percent males, which further reduces the value due to the limited roe production. Annual commercial catches since 1961 have ranged from 220-87,000, averaging 37,600. The recent 5-year average is 54,600.

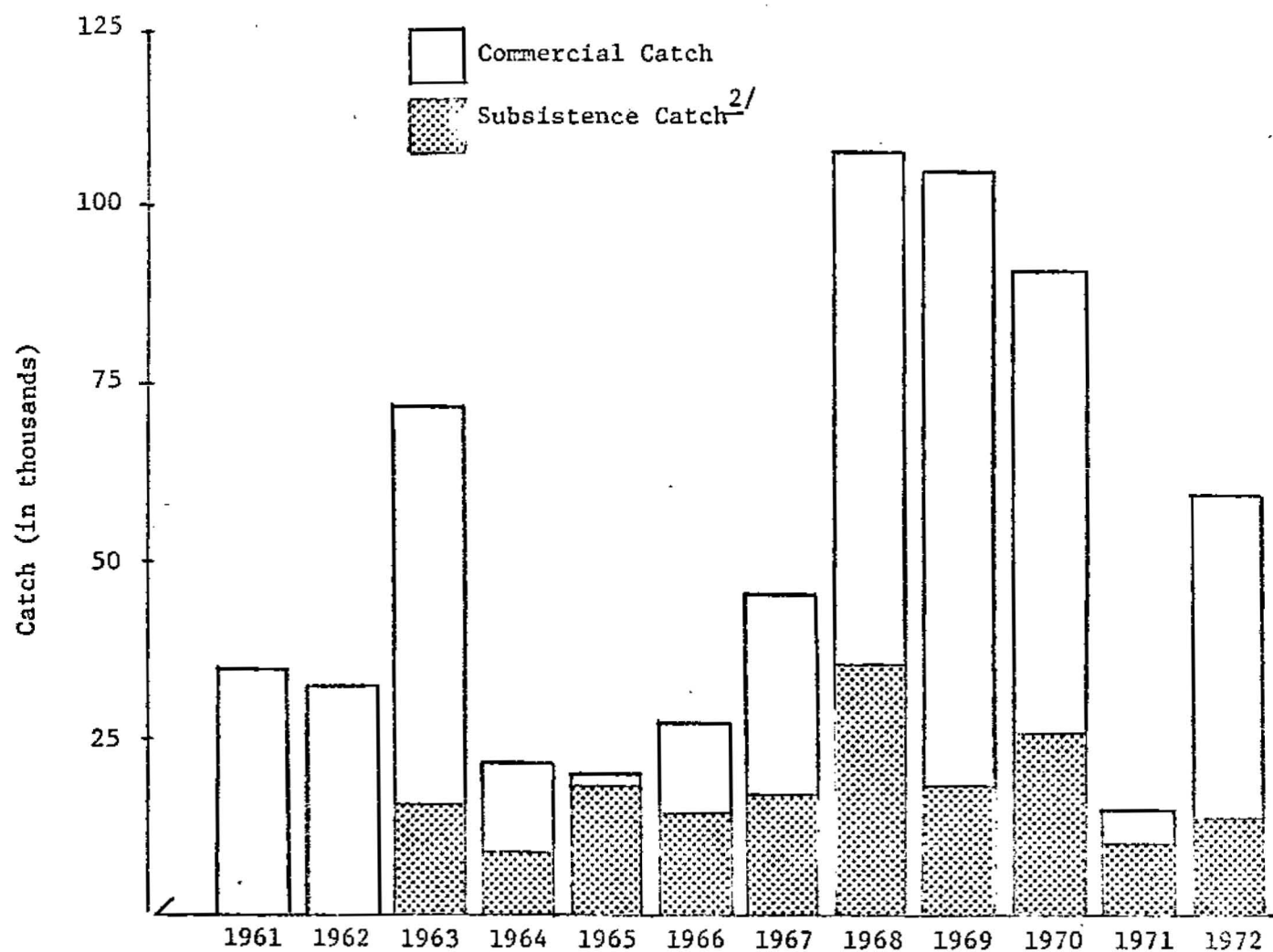
Annual subsistence catches since 1963 have ranged from 9,200 to 37,000, averaging 18,800.

Effort data (since 1961): Commercial and subsistence fishing effort is identical to that shown for chum salmon (Figure 18).

Escapement data: Table 21 presents comparable annual escapement indices. Escapements were quite large compared to harvests and exhibited large annual fluctuations.

Status related to MSY: Gross estimates of total pink salmon returns during the last three years are: 1,900,000 in 1970 400,000 in 1971 and 565,000 in 1972. Estimated annual harvest rates are usually less than ten percent. A conservative estimate is that maximum annual commercial harvests in the past, ranging from 200,000 to 1,000,000, could have been taken if all sub-areas received optimum effort.

Figure 17. Norton Sound area pink salmon catch data, 1961-1972.^{1/}



^{1/} Effort data identical to that reported for chum salmon.

^{2/} Catches not documented prior to 1963.

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Management and research strategy: The staff will increase efforts to encourage greater pink salmon utilization by commercial fishermen, buyers and processors. Since the normally more abundant pink salmon migrate concurrently with chums, care must be taken to prevent overharvest of the latter species. Changes in fishing gear will be explored, including the use of purse seines, beach seines and smaller mesh gill nets. Also, exploratory fishing in some of the more remote sub-areas suffering from limited effort might be encouraged by granting increases in commercial fishing time.

Other comments regarding management and research strategy as discussed under "chum salmon" apply to pink salmon as well.

Economic status: The present annual value of the commercial pink salmon harvest to the fishermen (based on the recent 5-year average catch x most recent price per unit) is \$9,300. If the pink salmon runs were harvested at estimated MSY in all sub-areas, then the potential annual values (based on recent prices) would range from \$50,000-\$250,000.

Recent subsistence catches have averaged 56,000 pounds (round weight) annually. Most of this catch is dried and fed to dogs (10,000 pounds processed weight). If a similar amount of protein would have to be purchased locally at \$.75 per pound, then the value of the subsistence fishery is estimated at \$7,500.

Table 20. Norton Sound area historical pink salmon catches, 1961-1972.

Year	Commercial	Subsistence	Total
1961	34,237	<u>1/</u>	34,237
1962	33,187	<u>1/</u>	33,187
1963	55,625	16,607	72,232
1964	13,567	9,225	22,792
1965	220	19,131	19,351
1966	12,778	14,335	27,113
1967	28,879	17,516	46,395
1968	71,179	36,912	108,091
1969	86,949	18,562	105,511
1970	64,908	26,127	91,035
1971	4,895	10,863	15,758
1972	45,182	14,158	59,340

1/ Subsistence catch surveys were not conducted during 1961-1962.

Table 21. Norton Sound area comparative pink salmon escapement data, 1963-1972.^{1/}

Year	Niukluk River (Golovin sub-area)	Fish River (Golovin sub-area)	Kachavik River (Golovin sub-area)	Kwiniuk River (Moses Pt. sub-area)	Tubutulik River (Moses Pt. sub-area)
1963	4,103	25,728 ^{2/}	16,000	3,779	4,355
1964	10,495	10,935	3,675	-	10,043
1965	-	-	-	8,301	-
1966	8,600	17,955 ^{2/}	1,788	10,629	26,000
1967	20,546	13,510 ^{2/}	1,780 ^{2/3/}	3,508	22,475 ^{2/}
1968	85,125 ^{2/}	164,000 ^{2/}	-	126,764	-
1969	92,650	124,000	4,525	56,683	12,788
1970	60,350	198,000	-	235,131	136,590
1971	8,370	1,670	5,323	16,742	7,500
1972	22,600 ^{3/}	13,050 ^{3/}	16,950	62,461	21,100 ^{3/}

^{1/} All escapements represent "high counts" from aerial surveys except Kwiniuk River data during 1965-1972, which was obtained through use of counting tower.

^{2/} Includes chum salmon, species breakdown not possible.

^{3/} Poor survey conditions or partial count.

REGION NORTHERN
GEOGRAPHICAL MANAGEMENT UNIT NORTON SOUND (333)
SPECIES CHUM SALMON

Historical harvest data: Table 22 and Figure 18 present commercial and subsistence catches dating back to the inception of the commercial fishery in 1961. Chum salmon have been the most valuable species taken commercially in the area. This species exists in commercial quantities in all localities, with the possible exception of the Nome sub-area. Annual commercial catches have ranged from 36,800 to 182,800, averaging 96,800. The recent 5-year average is 93,600. Peak fishing effort and processing capabilities existed in most sub-areas during 1962-1964 when the largest catches were made. During these three years, the annual commercial harvests averaged 162,000.

Annual subsistence catches made since 1963 have ranged from 11,700 to 30,800, averaging 19,100.

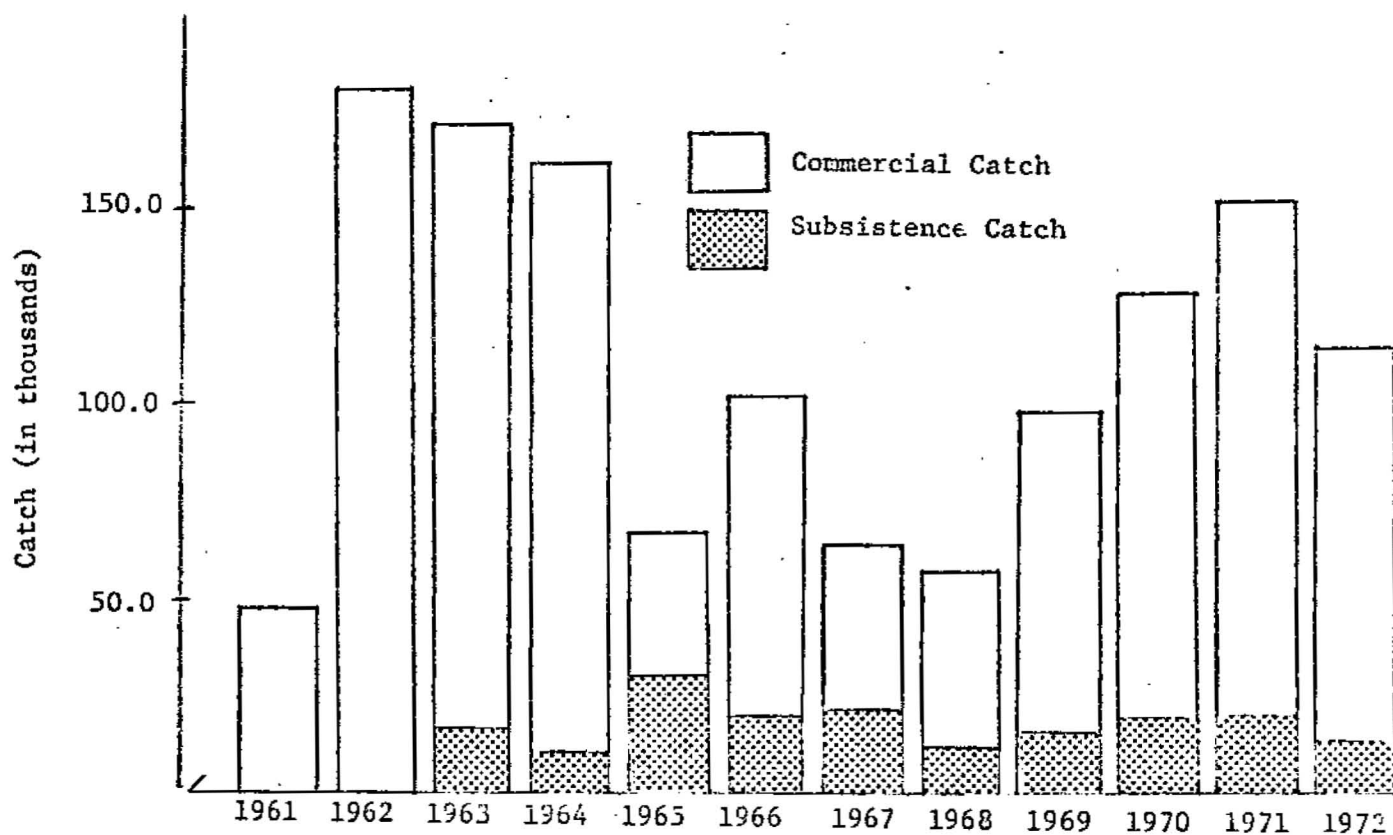
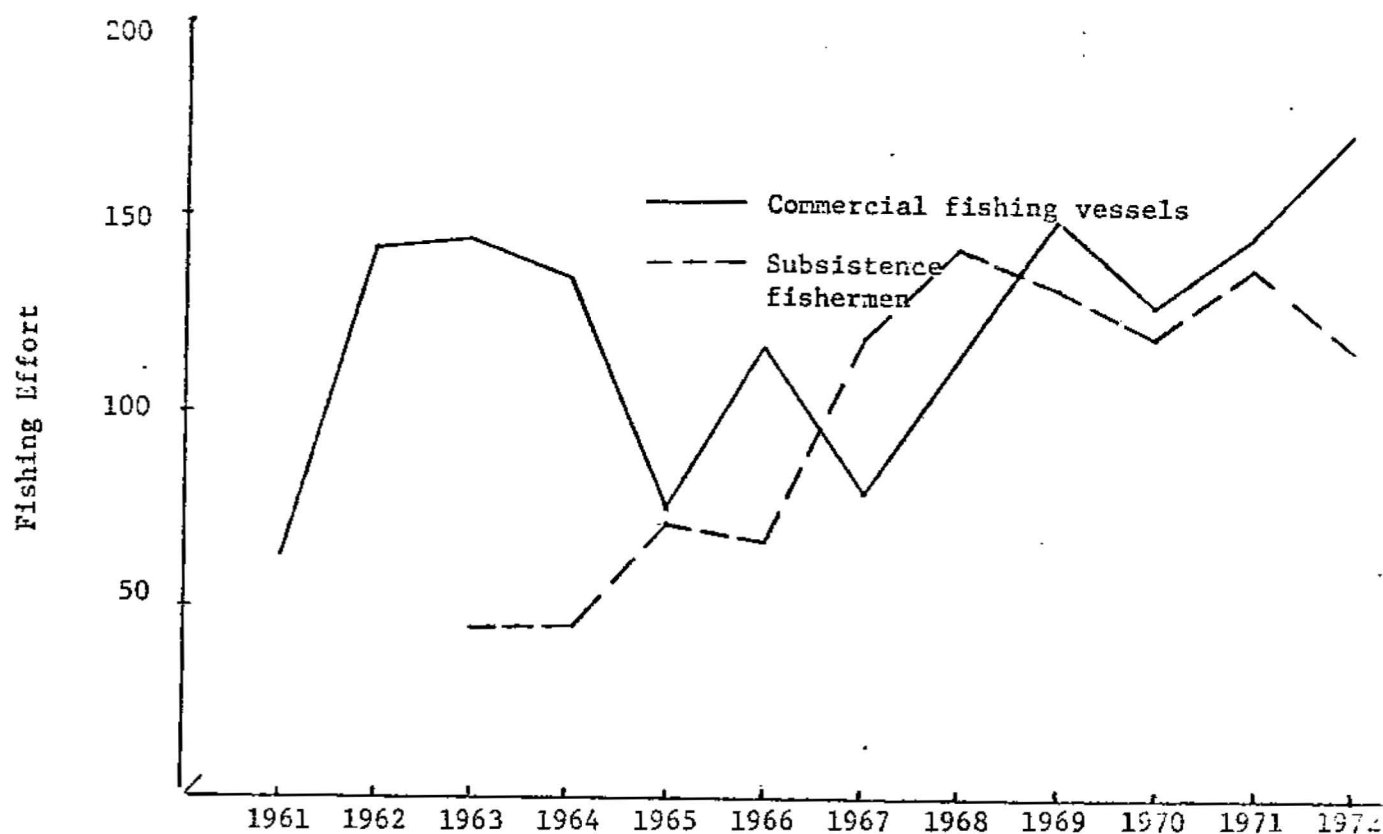
Effort data (since 1961): Registered fishing vessels for the area since 1961 have ranged from 62 to 171, averaging 121 annually. The recent 5-year average is 141, indicating a trend of increasing effort (See Figure 18).

Subsistence fishermen since 1963 have ranged from 44 to 141, averaging 99.

Escapement data: Comparable escapement indices are presented in Table 23. Escapement information remains poor or totally lacking for some streams, including all Norton Bay sub-area streams. Escapements documented to date exhibit annual fluctuations, but trends in declining numbers of spawners are not evident.

Status related to MSY: Gross estimates of the total chum salmon returns to Norton Sound, based on available catch and escapement data, for the last

Figure 18. Norton Sound area chum salmon catch and effort data, 1961-1972.^{1/}



^{1/} Subsistence fishery catch tabulation not made prior to 1963 and is incomplete prior to 1967. Many fishermen reported both commercial and subsistence catches.

three years are: 517,000 in 1970; 359,000 in 1971 and 247,000 in 1972.

Greater commercial harvests could have been made during most recent years if all sub-areas had received optimum fishing effort. It is further estimated that MSY for the entire area ranges between 170,000 to 270,000 (commercial and subsistence) during most years.

Management and research strategy: The in-season management of the commercial fishery is based on analysis of comparative commercial catch and escapement data. The duration of the fishing season and weekly fishing periods is occasionally changed by emergency order to compensate for either unusually small or large runs. Commercial fishing is normally allowed for two 48-hour periods per week which normally allows for adequate escapements.

There are few restrictions placed on subsistence fishermen except that licensed commercial fishermen are prohibited from fishing for personal use during closed commercial fishing periods.

Increasing harvests to MSY levels presumes that accurate information regarding run magnitudes and optimum escapement levels is available. The lack of this comprehensive escapement information has been responsible for the conservative approach to management of the commercial fishery.

Escapement monitoring has improved gradually since 1961. Counting tower sites are now established on two streams and aerial surveys are made with varying results of several other streams. A chum salmon tagging project conducted in the Unalakleet River has met with varying results in assessing spawning population magnitude. Tagging projects conducted in coastal waters are needed to determine the origin and degree of stock intermingling in the various sub-areas.

Establishing counting tower sites on one or two additional streams, expanding aerial survey coverage to other streams and initiating a comprehensive salmon stock separation study are planned and will be initiated once funding is available.

Economic status: The present annual value of the commercial chum salmon harvest to the fishermen (based on the recent 5-year average catch x most recent price per unit) is \$71,000. If the chum salmon runs were harvested commercially at estimated MSY levels in all sub-areas, then the potential annual values (based on recent prices) would range from \$112,000-\$188,000.

Recent subsistence catches have averaged 120,000 pounds (round weight) annually. It is estimated that 12,000 pounds (dressed weight) are consumed fresh by people and 27,000 pounds (processed weight) of dried fish are consumed by both people and dogs. If a similar amount of protein would have to be purchased locally (\$2 per pound for fresh fish and \$1 per pound for dried fish), then the value of the subsistence fishery is estimated at \$51,000.

Table 22. Norton Sound area historical chum salmon catches, 1961-1972.

Year	Commercial	Subsistence	Total
1961	48,332	<u>1/</u>	48,332
1962	182,784	<u>1/</u>	182,784
1963	154,789	17,635	172,424
1964	148,862	12,486	161,348
1965	36,795	30,772	67,567
1966	80,245	21,873	102,118
1967	41,756	22,724	64,480
1968	45,390	11,661	57,051
1969	82,795	15,615	98,410
1970	107,034	22,763	129,797
1971	131,362	21,815	153,177
1972	100,922	13,873	114,795

1/ Subsistence catch surveys were not conducted during 1961-1962.

Table 23. Norton Sound area comparative chum salmon escapement data, 1963-1972.^{1/}

Year	Niukluk River (Golovin sub-area)	Fish River (Golovin sub-area)	Kachavik Creek (Golovin sub-area)	Kwiniuk River (Moses Pt. sub-area)	Tubutulik River (Moses Pt. sub-area)
1963	13,687		16,000	11,340	16,069
1964	8,395	18,670	5,284	14,533	15,469
1965	-	-	-	26,634	-
1966	21,300	17,955 ^{2/}	1,780 ^{2/3/}	32,786	4,363
1967	-	13,510 ^{2/}	-	24,444	22,475 ^{2/}
1968	85,125 ^{2/}	164,000 ^{2/}	-	18,813	-
1969	10,240	2,080	600	19,687	12,040
1970	7,300	76,550	500	68,004	53,290
1971	22,605	13,185	10,000	39,046	16,820
1972	10,500 ^{3/}	3,616 ^{3/}	3,100	30,686	8,070 ^{3/}

^{1/} All escapements represent "high counts" from aerial surveys except Kwiniuk River data during 1965-1972, which was obtained through use of counting tower.

^{2/} Includes chum salmon, species breakdown not possible.

^{3/} Poor survey conditions or partial count.

REGION NORTHERN

GEOGRAPHICAL MANAGEMENT UNIT KOTZEBUE AREA (331)

SPECIES SALMON

REGION NORTHERN

GEOGRAPHICAL MANAGEMENT UNIT KOTZEBUE AREA (331)

The Kotzebue management area includes all waters from Cape Prince of Wales to Point Hope (Figure 14). The bulk of the salmon found in this area are chum salmon that originate in the Noatak and Kobuk Rivers. King and pink salmon are present in very limited numbers.

Commercial fishing dates back to the 1914-1918 period when canned and hard salt salmon were processed. Commercial salmon fishing was resumed in 1962 and has continued annually since then. Most of the catch in the early 1960's was processed locally by cannery vessels. During the past few years the bulk of the catch has been delivered gilled and gutted to a Japanese freezership anchored approximately ten miles offshore Kotzebue by a local native fishing cooperative.

Commercial fishermen are restricted in fishing only the northeastern portion of Kotzebue Sound or relatively close to the mouths of the Noatak and Kobuk Rivers. Set gill nets are the only legal gear allowed. Nearly all of the commercial fishery participants are local Eskimos.

Although subsistence catches are still very important, especially to Kobuk River residents, there has been a gradual decline in effort and dependence over the past few years. Annual subsistence catches have been documented since 1962.

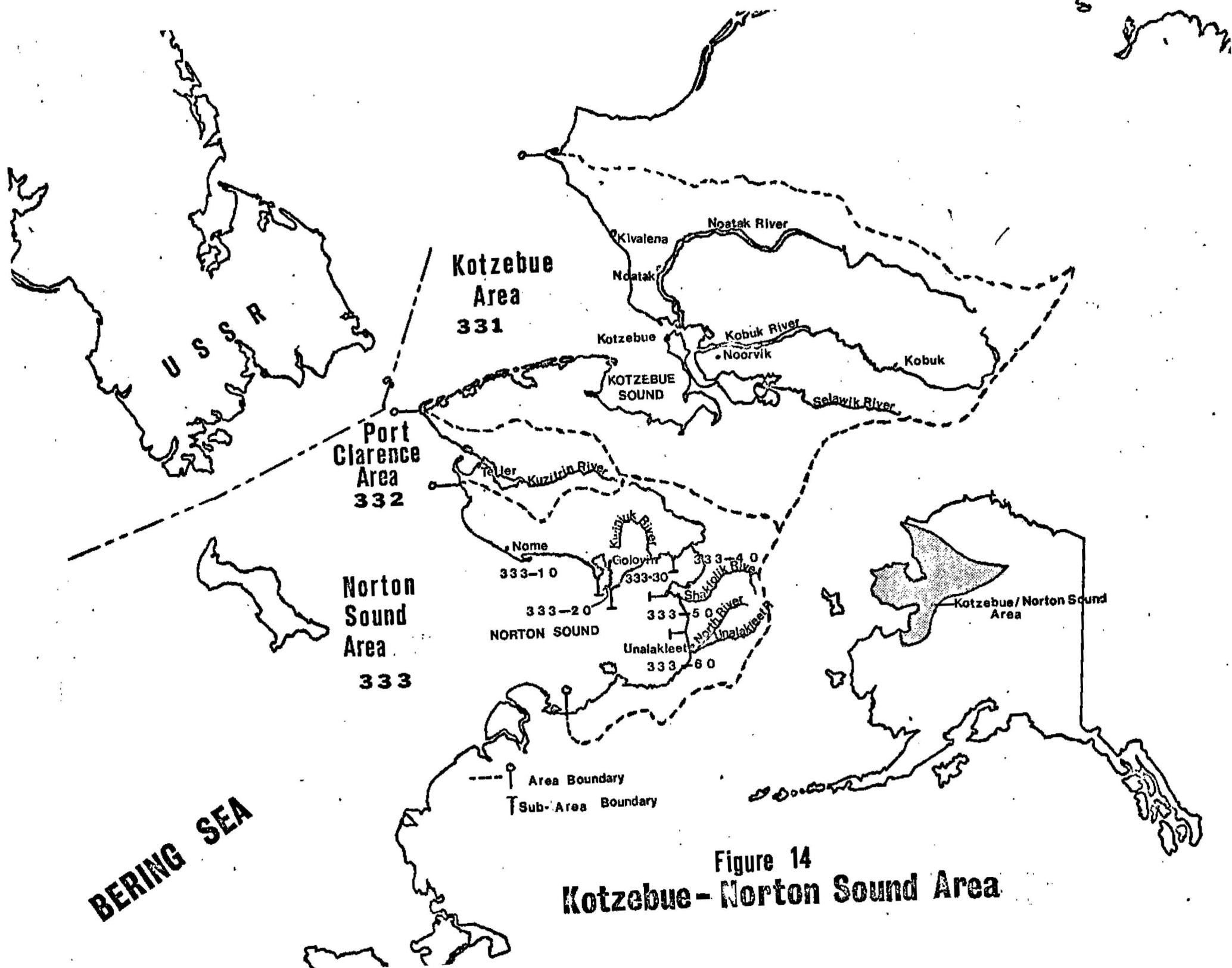


Figure 14
Kotzebue-Norton Sound Area

REGION NORTHERN
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SPECIES CHUM SALMON

Historical harvest data: Table 24 and Figure 19 show commercial and subsistence catches made in the area since 1962. The best commercial catches are made during mid-July through early September. Annual commercial catches have been quite variable since 1962 ranging from 29,400 to 170,782 and averaging 69,584. The recent 5-year average is 115,025, which reflects the strong returns experienced during the 1970-1972 seasons. Commercial catches have been strongly influenced by seasonal variations in abundance. These extreme fluctuations are probably normal since the Kotzebue area represents the northern range for North American chum salmon.

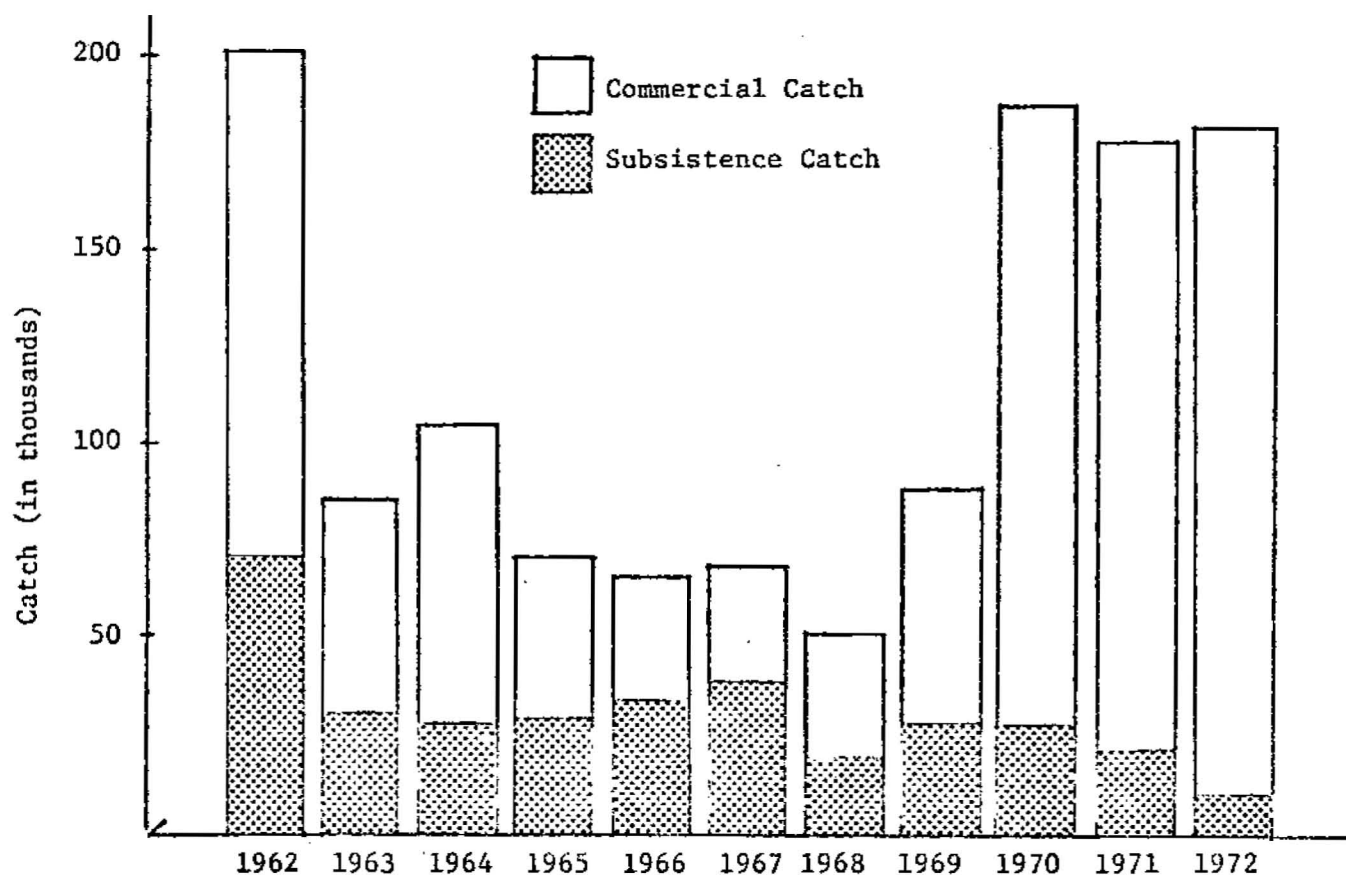
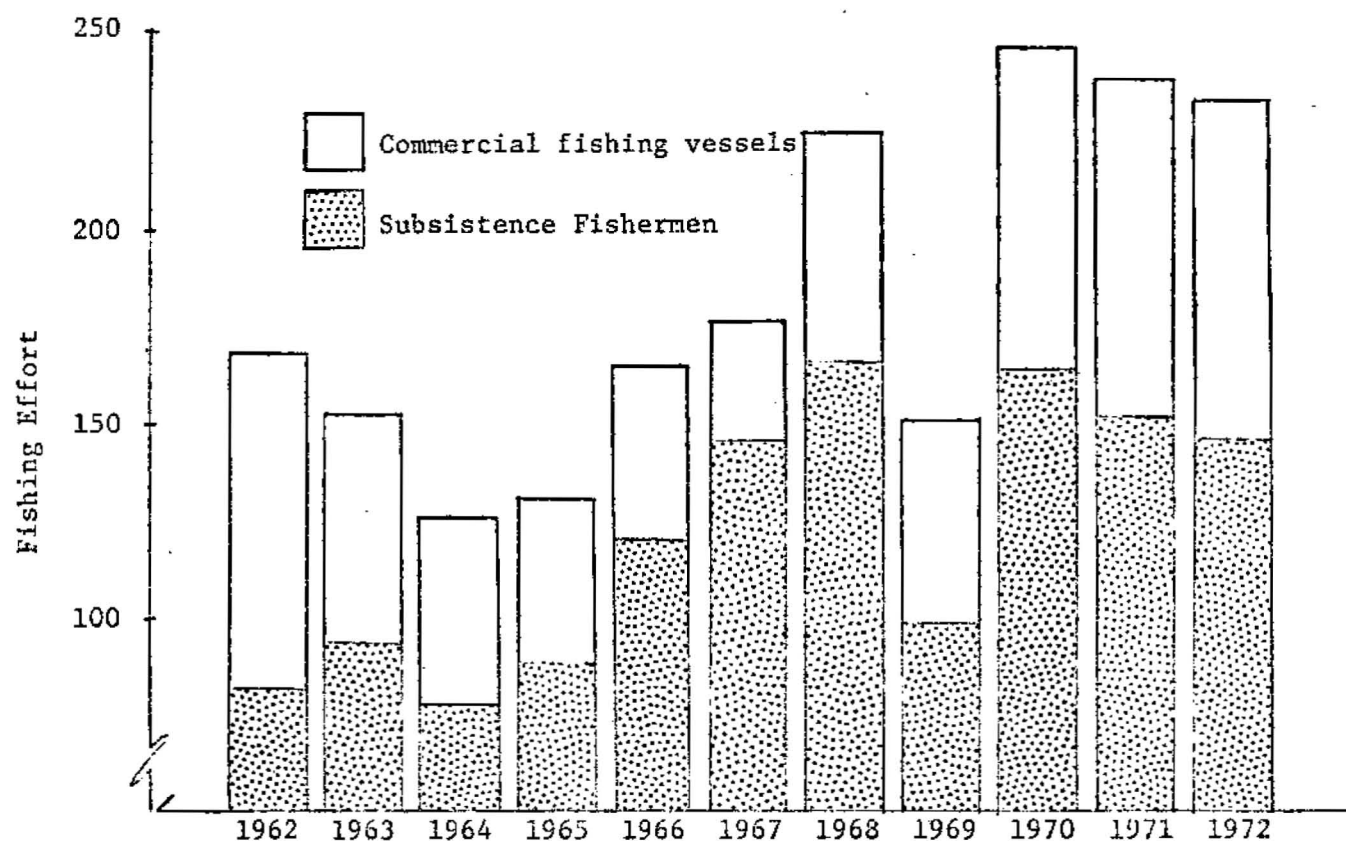
Annual subsistence catches since 1962 have ranged from 11,085 to 70,283, averaging 31,984. The smallest catch was recorded in 1972, which was partially the result of incomplete survey coverage.

Effort data (since 1962): Commercial and subsistence fishing effort is presented in Figure 19. Commercial fishing effort in terms of registered fishing vessels has ranged from 30 to 87, averaging 61 annually. There is no licensing registration deadline date which results in the registration fluctuating with the size of the runs and resultant harvests.

Subsistence fishermen since 1963 have ranged from 58 to 165, averaging 115.

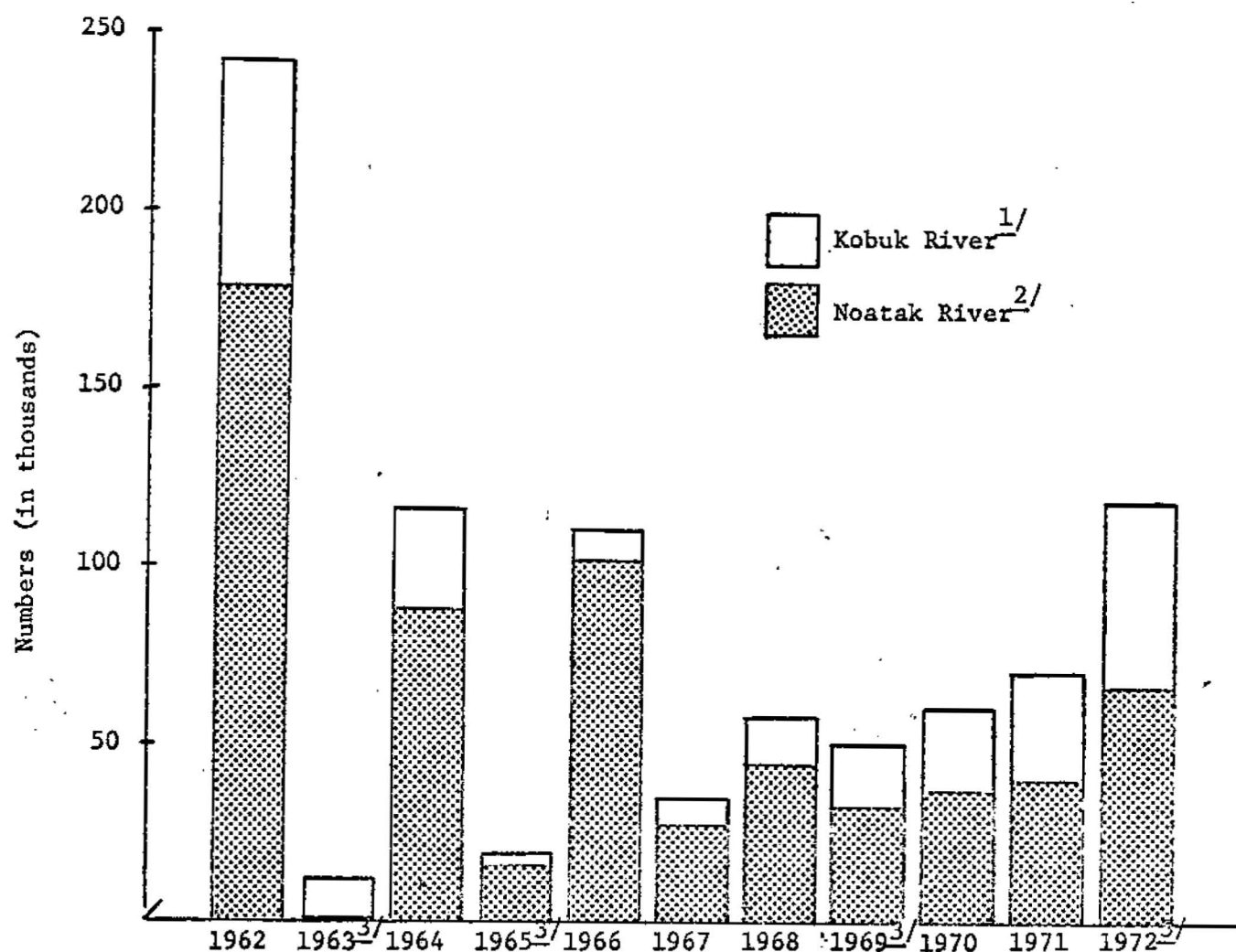
Escapement data: Comparative aerial survey counts of spawning chum salmon are presented in Figure 20. These counts are considered minimal since surveys were not always flown under optimum conditions or of all spawning areas.

Figure 19. Kotzebue area chum salmon catch and effort data, 1962-1972.



1/ Some subsistence fishermen reported both commercial and subsistence catches.

Figure 20. Aerial survey counts of Noatak and Kobuk River chum salmon, 1962-1972.



- 1/ For most years includes counts made above Kobuk village and includes annual counts of Squirrel and Salmon Rivers; also includes Tutuksuk River annual counts except 1965 and 1972.
- 2/ Includes annual counts of main river from mouth to confluence with Kelly River; also includes counts for some years of Kelly River, Kelly Lake and Eli River.
- 3/ Incomplete or poor survey conditions.

In August of 1960 biologists, under contract to the Atomic Energy Commission, conducted boat and aerial surveys of the Noatak River and estimated the chum spawning population at 930,000 fish. After observing this system since 1962, it is our opinion that the 1960 count was an overestimate. It is possible that the large numbers of char and whitefish normally present were mistaken for chum salmon.

Status related to MSY: Unrefined estimates of the chum salmon returns have been made for Noatak and Kobuk River stocks. Population estimates utilizing tag and recovery data were made during 1966-1968 when chum salmon abundance was low. These estimates of annual returns ranged from 173,000 to 257,000 fish. Estimates utilizing recorded catch and aerial survey counts range from 90,000 to 440,000 during the 1962-1972 period. Assuming a static subsistence harvest of about 30,000 fish, it is estimated that maximum allowable commercial harvests should range between 30,000 to 250,000 fish annually.

Considerable improvement of escapement monitoring is required before accurate assessment of run magnitudes and MSY can be obtained. Due to indicated large runs during several recent seasons, fishing time has been increased by emergency order beyond the normal four days a week schedule. Limited processing capability has prevented fishermen from taking full advantage of these time extensions. It is estimated that a minimum of 50,000 to 75,000 additional chum salmon could have been commercially harvested during each of the last three seasons.

Management and research strategy: In-season management of the commercial fishery is based on analysis of comparative catch and catch per unit of effort data. The duration of the fishing season and weekly fishing periods is occasionally changed by emergency order to compensate for either unusually large

or small runs. Commercial fishing is normally allowed for two 48-hour periods per week which normally allows for adequate escapements.

There are few restrictions placed on subsistence fishing except that licensed commercial fishermen are prohibited from fishing for personal use during closed commercial fishing periods.

Previous tag-recovery studies have indicated that the less abundant Kobuk River run peaks in the commercial fishing area during the last two weeks of July. There is greater subsistence utilization of Kobuk River stocks (versus Noatak) and the Department normally restricts commercial fishing time to two days a week during late July, especially when above-average effort is indicated.

Funding has recently been made available for an intensive escapement monitoring program of the Noatak River. The study will explore various enumeration methods and also involve test fishing inside the river mouth to provide run timing and abundance information needed for more flexible management.

Due to extreme variations in annual chum salmon abundance that have been exhibited, future studies should determine the feasibility of forecasting returns.

The commercial fishery potential of southern Kotzebue Sound near the villages of Deering, Candle and Buckland should be investigated. Recent inquiries from local residents have been made regarding opening this area to commercial salmon fishing. Pink and chum salmon are known to occur in this area, but species composition, distribution and abundance are unknown.

Economic status: The present value of the commercial chum salmon harvest (based on recent 5-year average catch x most recent year price per unit) is \$260,000. The potential value during each of the last three seasons is estimated to be closer to \$500,000.

Recent subsistence catches have averaged 185,000 pounds (round weight) annually. It is estimated that 19,000 pounds (dressed weight) are consumed by people and 33,000 pounds of dried fish (processed weight) are consumed by both people and dogs. If a similar amount of protein would have to be purchased locally (\$2 per pound for fresh fish and \$1 per pound for dried fish), then the value of the subsistence fishery is estimated at \$71,000.